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II

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THE PSYCHOLOGICAL BULLETIN

THE MATCHING METHOD APPLIED TO INVESTIGATIONS OF PERSONALITY *

BY P. E. VERNON

The Maudsley Hospital, London

The matching method may be defined as a method for establishing quantitative relationships between qualitative aspects of personality. Its object is therefore similar to that of correlation methods, but it applies chiefly to psychological characteristics which are not readily accessible to correlational treatment, *e.g.* to patterns of facial expression, voice, gestures, gait, handwriting, and to artistic and literary style. These *modes of expression* constitute, for the layman or for the psychiatrist, very important clues to personality, but they have been largely neglected by the experimental psychologist because, when treated by the stock methods, they generally fail to come up to expectations. Thus in studying the relationship of facial expression to personality, objective measures of the dimensions of the cranium, forehead, etc., give correlations little better than zero with tests of abilities or with ratings on traits. Nor are the coefficients much better when photographs are rated or ranked on a series of separate traits such as intelligence, neatness, and sociability (62, 64). Similar negative results have been obtained with observations of the subjects in person (57), with the voice (76), and with handwriting (63). But such results do not necessarily prove the deceptiveness of modes of expression; they may be due to the inadequacy of the experimental

* The writer is indebted to the Managers of the Pinsent-Darwin Studentship in Mental Pathology, who made possible the investigations upon which this article is largely based; also to the Medical Officers of the Maudsley Hospital for the facilities that he obtained, and to Professor G. W. Allport for his many suggestions.

and statistical techniques which were employed. For when a judge interprets an expression, he tends to conceive of the personality as an integrated whole, and the traits that he discerns are considered to be uniquely organized within the individual subject. Instead of studying these structured impressions, the investigator forces the judge to abstract a series of *separate* traits from a *group* of subjects, in order to obtain variables which can be intercorrelated with his criterion variables. Matching offers another technique which, though it is quite as objective, is much less artificial. For example, the judge may write a short sketch of the personality which he deduces from each facial expression; then half a dozen of such sketches are given to an intimate acquaintance of the subjects, and he picks out the one which seems to him best to fit each subject. As an alternative, the acquaintances may prepare brief case studies or sketches of the personalities of half a dozen subjects, and these are presented to the judge together with the photographs (numbered in a different order) for him to fit or match together.

For fuller discussions of this psychological background of matching, see Von Bracken (10), Arnheim (5), Wolff (49), Allport and Vernon (4), and Vernon (44).

STATISTICAL PROCEDURE IN MATCHING

The following symbols will be adopted throughout: t = the number of elements to be matched. An ordinary matching experiment in which equal numbers of elements are matched together is denoted as $t:t$. n = the number of judges; N = the total number of judgments or matches. S = the proportion of judgments that are correct; s = the number of correct matches obtained by the average judge. Thus $s = St$.

Probability of a Matching Result. In a $t:t$ experiment the average judge can always get one of his matches correct by chance (cf. Zubin, 51). Thus if $s > 1$ or $S > \frac{1}{t}$, there must be some positive relationship between the series which have been matched. Continental psychologists such as Binet, Arnheim, and Wolff, to whom the development of matching is largely due, have generally merely stated the extent to which their results exceeded this chance proportion. But such statements tell us nothing about the actual probability or validity of their findings. Statisticians from Montmort (1708) onward have been interested in this probability (cf. Todhunter, 77), but the true solution of the problem where more than one judge takes part was

first given by Chapman (17). He shows that the chance distribution of values of s is not normal, but skewed and leptokurtic; hence none of the techniques which evaluate a matching result in terms of a difference or a coefficient and its P.E., with reference to tables of the normal curve, are strictly legitimate. And he provides a table of probabilities of various values of s up to three places of decimals.

For most practical purposes, however, Chapman's table is too limited in range, and his general statistical solution is difficult for the experimental psychologist to apply. Moreover, Vernon has found that when the value of s is decidedly greater than 1.0 (though still much less than t), the chance distribution around this value does approximate normality (46). Vernon examines a number of alternative techniques, and recommends one that is based on a modification of the mean square contingency technique, which will express any matching result in terms of a coefficient (analogous to a correlation coefficient) and its probable error. His formulæ, which appear below, are supported by the results of a number of statistical experiments; and the technique will be adopted here because it seems the most convenient means of handling the large amount of data to be surveyed, and the most widely applicable to a variety of matching investigations.

The Contingency Matching Technique. In a $t:t$ matching experiment the formulæ are:

$$C = \sqrt{\frac{(St-1)^2}{(t-1) + (St-1)^2}} \quad [1]$$

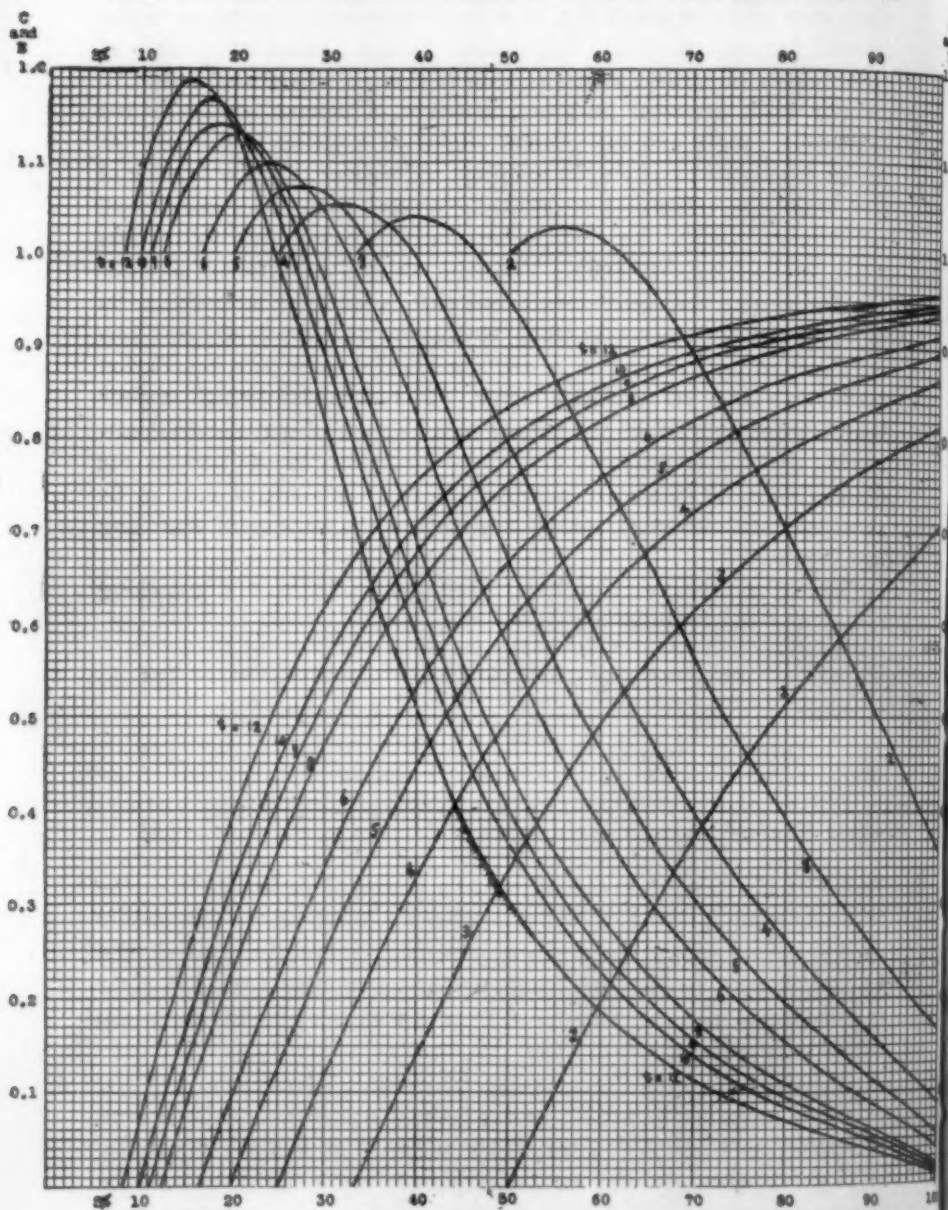
$$\text{Probable error of } C = \frac{0.6745 E}{\sqrt{N}} \quad [2]$$

$$\text{where } E = (t-1) \sqrt{\frac{(St-1)[(t-1)^2+1] + t[(t-1) - (St-1)^2]}{t[(t-1) + (St-1)^2]^3}} \quad [3]$$

Both C and E may be read off, to two places of decimals, from the following graph, which includes curves for most of the commonly adopted values of t . For a given value of $S\%$ (on the x axis), the value of C may be read off from the curves running from top right to bottom left, and the value of E from the curves running from top left to bottom right.

Matching Unequal Numbers of Elements. Though most of the published experiments are of the $t:t$ type, it is possible, perhaps even preferable, to employ $t':t$ matching, where t' is a smaller number of elements than t . For example 3 personality sketches may be presented together with 6 photographs, out of which the judges have

GRAPH OF CONTINGENCY COEFFICIENTS AND THEIR STANDARD ERRORS $\times \sqrt{N}$ FOR ALL VALUES OF S% IN MATCHING EXPERIMENTS WHERE $t=2, 3, 4, 5, 6, 8, 9, 10$ or 12



to pick the 3 that go with the sketches. Chapman has worked out the exact statistical solution of this type of matching (18). Alternately, formulæ [1] and [3] may be applied, since neither C nor E are dependent on the size of t' . S is still the proportion of judgments that are correct, but N is now nt' instead of nt . Thus the

$$\text{probable error of } C = \frac{0.6745 E}{\sqrt{nt'}} \quad [4]$$

One other type of matching is occasionally used; it may be termed the matching of equivalent elements. For example, 10 handwriting specimens may be presented, and the judges required to pick out the 4 female specimens, the rest being male. The technique for evaluating the results is similar; but some modifications of formulæ [1] and [3] are necessary, and these are discussed elsewhere (46).

Matching More than One Set of Material. If m sets of similar material are matched in one experiment, the notation $m \times t:t$ or $m \times t':t$ is adopted. Thus the same group of judges might match 5 sets of 3 personality sketches and 6 photographs ($5 \times 3:6$). C and E are calculated as before, S being the total proportion of correct matches in all the sets. The P.E. of C for the *average* experiment is then given by formula [4]. The P.E. for the *combined* experiments can be calculated empirically from the judges' total scores, but it cannot, in general, be predicted by a formula; for Vernon has shown that it is affected by the presence of any positive intercorrelation between the several sets of material (47). Only when this correlation is zero can we apply formula [2], putting $N = nmt'$.

Should it be desired to combine into one total result a number of experiments with diverse values of t , this can be accomplished by working out χ^2 and $N\psi^3$ for each experiment.

$$\chi^2 = \frac{N(St-1)^2}{(t-1)} \quad N\psi^3 = n \left[1 + \frac{1}{(t-1)^2} \right] (St-1)^3$$

The separate results are summed to give the total χ^2 and $N\psi^3$; ϕ^2 and ψ^3 , and C and its P.E. are then obtained by the usual method (Kelley's formulæ Nos. 224 and 232). Again, however, it is better to calculate the P.E. of the average experiment, rather than of the combined experiments (unless there is no correlation between the judges' scores on the several experiments).

Second or Further Choices in Matching. If the judges wish to give second or further choices for some of the elements, these additional judgments can readily be incorporated in the final result by the technique described in the preceding paragraph. But the modified

formulae for χ^2 and $N\psi^2$ are somewhat complex, and may be consulted elsewhere (46). The inclusion of these additional choices is unlikely to affect greatly the statistical validity of the final result, except when their number is large and when S' (the proportion correct) is much bigger than S . But they may be of considerable psychological interest (cf. below).

Comparing Contingencies from Different Experiments; Comparing Contingencies and Correlations. According to an experiment by Vernon (46) it is legitimate to compare the results of two matching experiments, and to explore the reliability of the difference between C_1 and C_2 by adapting the usual formula:

$$\sigma_{diff.} = \sqrt{\sigma_{e_1}^2 + \sigma_{e_2}^2 - 2r_{1.2} \sigma_{e_1} \sigma_{e_2}}$$

When experiments by different groups of judges are so compared, $r_{1.2}$ is, of course, zero.

The results of a matching experiment expressed as a contingency, and of an experiment with tests or ratings expressed as a correlation, cannot properly be compared by the same formula. Rough comparisons between a C and an r are, however, justified; for coefficients of equal size and P.E. do represent approximately equal degrees of interrelationship. Toward the upper limits the analogy fails, since the maximum possible value of C is $\sqrt{\frac{t-1}{t}}$, which is 1.0 only when

t is infinite. The remarkably high general level of coefficients cited in the table below, may perhaps engender a suspicion that the contingency technique yields coefficients (like the coefficients of association and colligation) which are larger than would be obtained if correlation techniques could be applied to the same matching data. However, it is actually found, by comparing $(S - \frac{1}{t})$ with the so-called forecasting efficiency of a correlation, that matching results are usually less favorable, the C 's being somewhat smaller in most experiments and the P.E.'s somewhat larger.

The P.E. of the Material. The probable errors which we have discussed so far refer to variations in the value of C which may be expected should another group of judges match the same material. They do not cover the variations to be expected should the same group of judges match other sets of material. But Vernon has shown that the variability of the subjects (whose modes of expression are matched) is likely to be the same as the variability of the judges or

matchers (47). Thus when one judge matches m sets of material, the formula for the P.E. of the material is $\frac{0.6745 E}{\sqrt{mt}}$ [5]

This has been confirmed by the empirical results of experiments where a few judges matched a large amount of material. It is not possible at present to predict the P.E. of material matched by more than one judge if, as is generally the case, there is any intercorrelation between the judges; (when there is no such correlation, the P.E. of the material is obtained by putting $N = nmt$ in formula [2]). We can, of course, calculate the empirical variability of the combined judges' results on the actual sets of material available. But the simplest procedure is to determine the P.E. of the material for the average judge, by means of the above formula [5].

CONDITIONS THAT AFFECT MATCHING

Before a definite relationship between 2 intermatched series (*e.g.* photographs and sketches) can be inferred from the resulting contingency coefficient and its P.E.'s, the possible influence of certain extraneous factors must be considered. In planning a matching experiment, moreover, these factors must be controlled as far as possible.

The Size of t , and Other Technical Factors. By means of special statistical experiments Vernon (46) has found that the validity of a matching result is not affected statistically by the number of elements matched at a time. $\frac{C}{\sigma_c}$ will be the same whether n judges match either 3 photographs and sketches, or 6 pairs of the same difficulty. Naturally they will find the 3:3 task much easier than the 6:6, and both $S\%$ and C are likely to be higher in the former. But since twice as many judgments are made in 6:6 as in 3:3 matching, the final probability is not affected by the size of t .

In spite of this statistical equivalency, we must be cautious in comparing the results of experiments with different sizes of t , since there is a marked *subjective* effect. In unpublished experiments, the writer had 27 judges match 10 sets of 6 photographs with vocations, on 2 occasions. The sets were arranged as 1:3, 3:3, 1:6, 3:6 or 6:6 matching, and each of these types was compared with every other. The 1:6, 3:6 and 6:6 arrangements yielded results of almost identical validity, but the 1:3 and 3:3 arrangements always gave significantly

poorer results (cf. *IV—g, h*)*. The probable explanation of this finding is that when $t=3$ the task is too simple for the judges to display their maximum matching ability. Similarly Theiss' data (*XI—i*) show that 1:3 matching of handwritings with character sketches is more successful than 1:2 matching. But in another (less extensive) experiment of the writer's, where 10 photographs were matched with brief sketches either as 10:10 or as $2 \times 5:5$, the former arrangement was so difficult that most judges were unable to cope with the task, and the latter gave a slightly superior validity (*I—i, j*). Further experimental investigation of this factor is needed, but it is reasonable to assume that t possesses an optimum size for each type of material, depending mainly upon the number of impressions which the average judge can keep clear in his mind. For instance when Allport and Cantril (3) had voices matched with personality characteristics, they were justified in adopting $t=3$; for the voices were presented successively and the judges could hardly have remembered and compared mentally a larger number. On the other hand, the names of at least 6 vocations can be readily grasped and kept distinct. Thus an alternative arrangement for matching voices with vocations would be 1:6.

Allport and Vernon (4) draw attention to the possible influence of the order in which the material is presented, also to the fact that in $t:t$ matching some of the matches are based on a process of elimination rather than on genuine judgment. The first of these points hardly arises in simple experiments where the material can be studied and restudied several times before the judgments are made. In more complex experiments it can be controlled by presenting the material to different judges in different orders. The second factor should certainly be eliminated when possible by adopting $t':t$ instead of $t:t$ matching.

An additional advantage of uneven numbers of elements is the ready control that it affords over the difficulty of the experiment. For example, Buzby (14) investigated the ability to match 6 Piderit model faces with names of emotions; but 6:6 matching would be extremely easy, hence he transformed it into the much more difficult task of 6:18 matching by adding 12 extra names of emotions. Sometimes the material may be divided into complementary uneven sets; thus in an experiment by Vernon (47) where sets of 14 drawings of "a house" and 14 drawings of "a man" by the same children were matched together, the

* Roman figures refer, not to the bibliography, but to the *Table of Results of Matching Experiments* at the end of this article, which summarizes the experimental results of most of the published matching investigations. Thus *IV—g* means *Section IV* of the table, *Experiment g*.

material was arranged not as 14:14, nor 2×7:7, but as 4 houses against 10 men and the other 4 men against the other 10 houses.

The Ability of the Judges. The ability to match successfully is probably affected by:

(a) *Practice and Training.* This was demonstrated in experiments on recognition of emotions from photographs by F. Allport (53) and Guilford (61), although the matching technique was not actually employed. The clearest instance is to be found in graphology; in 3 diverse experiments Binet, Powers, and Cantril and Rand have shown that trained graphologists are far superior to laymen in matching handwriting with personality characteristics or sketches (XIV-a-b; XI-b, c, e, f).

(b) *Sex.* The only objective evidence from large comparable groups is that of Buzby (14), who had 430 male and 278 female students match Piderit faces with emotions. Women were slightly superior but not to a statistically significant extent, since their respective results give contingencies of $0.781 \pm .0095$ and $0.753 \pm .0087$. Rating experiments (e.g. Valentine, 78) also tend to show no difference, except in speed of judgment. Nevertheless it is possible that more complex and more natural judgments, such as can be attained by matching with personality sketches, might give better support to the adage of women's "intuitive ability."

(c) *Age and Intelligence.* Gates (59) and others noted a regular increase in recognition of emotions with age up to 12 or 14 years, but did not employ matching. Theiss found the same in the matching of handwriting with thumbnail character sketches (XI-i). The influence of chronological age is, however, probably largely due to mental age, for matching ability almost certainly correlates with intelligence. In experiments by Vernon (43, 44) the average correlation of 10 single short matching tests with intelligence was only +0.20; but since the average intercorrelation of matching tests themselves is low, a rough estimate of the correction for attenuation suggests that the true correlation between "general matching ability" and intellect may be +0.70 or more.

(d) *Artistic Tendencies.* Vernon (43) found small positive correlations, averaging +0.19 between 8 matching tests and a battery of tests of artistic interests. Again a large correction for attenuation is needed.

(e) *Social Qualities.* In the same research no significant correlations were obtained with a battery of tests and ratings for sociality, though there was a slight indication of a negative tendency. If this is confirmed it would fit in with Adams' claim that the extravert is better at judging himself, the introvert better at judging others (52).

Possibly we are hardly justified in talking of a "general matching ability." Vernon's average intercorrelation between 8 tests was only +0.085, giving a corrected consistency of +0.43. Subsequent experiments have confirmed its low reliability and consistency. Even within a single type of material such as 20 sets of photographs and vocations, and 35 sets of drawings of houses and men, the corrected reliability of the judges' abilities was only +0.55 and +0.57. If

intelligence and the relevant artistic, social, and other qualities were partialled out, it is not improbable that these figures would fall to zero, showing that there is no distinctive 'group factor' of intuitive ability. For practical research purposes, however, it would still be useful to have a group test of matching ability, containing a broad selection of different kinds of material, so as to obtain some control over the influence of judges' abilities. As an alternative, the main characteristics of the judges, such as their intellectual level, should be stated in presenting the results of matching experiments. In any extensive investigation where the results of several experiments are to be compared, both the judges and the size of t should, if possible, remain the same throughout.

The Heterogeneity of the Material. Most important of all the factors which influence a matching experiment is the heterogeneity or diversity of the material included in each set. This heterogeneity is presumably dependent on the distinctiveness or range of unlikeness among the subjects whose modes of expression and whose personalities make up the material. If (as in many investigations) we are merely concerned with comparing the *relative* values of C in different experiments, then it is legitimate to use subjects of an unknown degree of heterogeneity throughout. But the *absolute* values of C and its P.E.'s are meaningless if this factor is neglected. The same is true, of course, of a correlation coefficient. Hence investigators generally try to obtain a random sample of the population on which to work out their correlations. They can examine such randomness by means of the standard deviation of their subjects' scores; but in matching, the differences between the subjects in any one set of material are qualitative, so that no measure of dispersion comparable to the S.D. is at present available. (It is suggested below that this problem might be approached through a study of second choices and "good" errors). Presumably a really adequate matching experiment should employ at least 100 unselected subjects, who would be divided at random into m groups with a suitable size of t' and t . Both m and n should be large enough for the probable errors (of the material and of the judges) to be small.

Adequacy of Materials. Careful consideration must, of course, be given to the preparation of materials, both of the modes of expression and of the criteria against which they are to be matched.

Thus if handwriting is under investigation, the scripts should be spontaneous, not copies; but at the same time variations in content should be controlled (4). The matching of static photographs should not be claimed to show the maximum

relationship of facial expression to the criterion, for motion pictures might give better results, and the appearance of the living and moving subjects might reveal still more. Dunlap (58) and Jenness (65) discuss this point in the field of emotional expression. Allport and Cantril (2, 3, 15) have demonstrated that even the distortion produced in voices by transmission through a good radio set lessens their expressive value, *i.e.* reduces the success of matching. Arnheim (5), who presented a large amount of material by epidiascopic projection, draws attention to the danger of the experimenter suggesting the correct matches unwittingly; to avoid this he should not even look at the material presented on the screen during the experiment.

Though a number of experiments can be performed on the self-reliability of various modes of expression and on their interconsistency (*e.g.* the extent to which voice, handwriting, face, and gait "go together"), matching is likely to be applied chiefly to the comparison of such modes of expression with some criterion of inner dispositions in the subjects' personalities; and we know little so far as to the best mode of selecting and presenting such criteria. Objective criteria such as sex, age or vocation have often been used (*cf.* table). Allport and Cantril show that scores on standardized personality tests can be employed; but these require caution if the judges are not thoroughly familiar with the actual tests. For instance it would not follow that extraversion is not expressed in the features merely because matchings of photographs with the subjects' scores on some alleged test of extraversion were found to be unsuccessful. In any case the abstraction of single personality dispositions as criteria does not allow the judges to display their maximum ability in interpreting expressions. Nor are sketches which consist merely of lists or aggregates of unrelated characteristics suitable. Von Bracken (10) and Cantril (56) have shown that judges find difficulty in grasping such lists as meaningful pictures of real persons; that less detailed accounts in which the organization or form-quality of each subject's personality is stressed are better apprehended and remembered, and that general traits and attitudes are superior in these respects to descriptions of specific objective behavior. Further work is needed here, and the most appropriate length of sketches should be studied (*cf.* 4). Again, the presentation of previously prepared sketches should be compared with the alternative technique where the judges write sketches or characterizations which are then matched by acquaintances of the subjects.

PSYCHOLOGICAL PROBLEMS IN MATCHING

The choice of criterion is intimately bound up not only with the psychology of the matching process itself, but also with the wider problem of how we come to know people's emotions and traits. Many psychologists would ascribe such cognition to association and inference. They would point to Landis' (67) and Sherman's (73) classical experiments which indicate that our judgments are determined more by knowledge of the concrete external situation than by observations of the bodily expressions; also to Rice and Waller's (35) work on stereotypes which emphasizes the rôle of acquired habits and attitudes. The case for a more direct and immediate understanding is put by Koffka (66), while G. Allport (54, 55) argues that the two views are complementary, not irreconcilable; that previous experience is indeed involved but that it becomes intimately structured with the perceived expression, so that in a sense we may be said to know intuitively. Experimental evidence is meager, but several investigators have obtained introspections from their judges.

In the recognition of emotions from photographs, Langfeld (68), F. Allport (53), Guilford (61) and others note that many judges imagine an appropriate concrete setting or stimulus; others use empathic self-projection. The latter method was predominant in Roberts and Carmichael's study of manual expression (71). F. Allport, Walker and Lathers' (1) work on the matching of English themes contains much valuable data. They found that the common authorship of a group of themes was occasionally recognized from objective details such as grammatical errors, but that the chief cue was the individuality of manner or style in all the themes which seemed to the judges to express an organized dynamic personality. Again, in Vernon's (47) experiments on the matching of pairs of drawings, all the judges made use of features such as depth or pressure of line, peculiarities of shading, etc., but some of the most successful mentioned general artistic style and the imagination of a personality behind the drawings as the most helpful factor. The speed with which such interpretation was carried out is significant; each 4:10 experiment had to be done in 30 seconds, so that on an average each drawing was studied for only about 2 seconds. Arnheim (5) and Theiss (41) also discuss the matching process from the Gestalt viewpoint; the latter states that a quarter to a third of his judges used detailed signs in matching handwriting with character, whereas a half relied on general impressions. In Gahagan's (23) experiments on matching photographs with vocations, the chief bases of judgment were: resemblance to specific acquaintances, stereotypes, physiognomical or phrenological inferences from signs, and actual interpretation of facial expression, pose, attitude, and the like.

The relative importance of these several methods of judgment probably varies with the type of material. Thus in the establishment

of the uniformity of children's handwriting by Von Bracken (11, 12), objective details were doubtless used very frequently. (In some matching tests, the whole process may be intellectual; *e.g.* an achievement test in geography may present a list of countries to be matched with a list of capital cities. But we are not concerned with these here, nor with somewhat more interpretative tests such as McAdory's measure of Art Judgment, which is a $72 \times 4:4$ matching experiment). In the writer's unpublished experiments the judges, especially the less intelligent, generally seemed to look for specific objective signs, unless care was taken to exclude them. For instance it was necessary to avoid describing a subject as "cheerful" in a personality sketch which was to be matched with a photograph that portrayed him with a smile. The incidence of stereotypes is also abundantly proved by the frequency with which the *consistency* of the judges' matchings is greater than their *accuracy*; (it should not be forgotten, however, that the judgments often *are* accurate and not merely stereotyped). Probably the "typical" female handwriting (13, 20, 27) is as widely and as uncritically accepted as the typical Bolshevik or bootlegger (35), or the typical emotional expression of anger (67).

Nevertheless it is doubtful whether associative inference and stereotypes can give a satisfactory explanation of successful matching. Gahagan found that the general qualitative impressions and interpretations of his judges were often inconsistent, and concludes that they were largely rationalizations, due to the judges' inability to formulate their real reasons explicitly. The same phenomena of difficulty in verbal formulation and inconsistencies in the interpretation of the same personality by different judges, were noted by Allport, Walker and Lathers. Thus the very subjectivity of interpretation would seem to suggest that it differs from intellectual cognition and habit, though it may incorporate them or co-exist with them. In the solution of any problem we always use old habits as far as possible, but are yet capable of a new synthesis—the "insight" of Gestalt psychologists. Similarly in judging personality, interpretation may be insight of a predominantly emotional and artistic type, which cannot be analyzed down into the ordinary perceptual processes of traditional psychology.

Allport, Walker and Lathers point out that interpretation is a function of the personality of the judge as well as of the person judged, but they disagree with the theory that personality should actually be regarded as a relation between the person and his observers (*cf.* Vernon, 80), preferring to assume

that some judges may succeed and others fail to grasp the "real" personality. This raises another theoretical question—whether we should consider the true relationship between personality and its modes of expression to be that which is seen by the average judge of average ability, or that which the best judges can see. For example, should the dependence of handwriting on personality be denied because the untrained layman fails to perceive it, although some trained graphologists undoubtedly can perceive it with fair accuracy?

The study of failures in matching may also be illuminating. Powers (34) has shown that many matching errors are "good" ones, in the sense that though the expression is assigned to the wrong subject, yet his personality is somewhat similar to that of the right subject. These good errors are, unfortunately, not allowed for in the statistical evaluation of a matching experiment, as they are in a correlational rating experiment; but if second choices are scored many of them may contribute to the final result. Simple reversals are also often found, when A's expression is matched with B's sketch, and B's expression with A's sketch. Since good errors and reversals appear more frequently the more homogeneous the material, they may provide an avenue for investigating the difficult problem of likeness between people or distinctiveness and heterogeneity.

One great advantage of matching is that individual cases can be studied quantitatively. A separate contingency can be calculated for each pair of elements according to the proportion of correct matches it receives. Hence it is possible to show, say, that subject A's voice is more successfully matched with a personality sketch than is his facial expression, or that the reverse is true of subject B. But why, we must ask, do some subjects express themselves more fully in a given type of material than others? Sometimes the medium of expression is unsuitable merely from lack of experience; thus although young children express themselves more freely in facial play and gestures than do adults, yet neither their drawings nor handwriting reveal much because of their lack of technical skill. The most suggestive and most original investigation of such problems is that of Wolff (49, 81, 82). He obtained records of diverse modes of expression such as voice, profile, shape of the hand, gait (motion pictures), handwriting, and style of retelling a story, and found that the intermatching of these expressions gave only moderately successful results. He then presented the expressions singly to his judges, and had them write free characterizations of the subjects' personalities. His analysis of these characterizations strongly suggested that different expressions may often spring from different facets or levels

of personality, so that a high interconsistency should not be expected. It was also discovered that when the subjects themselves acted as judges they often failed to recognize their own expressions; yet some unconscious recognition probably took place, since they always reacted with greater emotional tone to their own expressions than to the expressions of others. Thus their unwitting self-characterizations were, on the average, double the length of their interpretations of others, and were usually so favorable that they appeared to represent wish-images, *i.e.* descriptions of themselves as they would like to be rather than of their generally recognized personalities. Another possible explanation of matching failures is suggested by these experiments, namely that the outward manner and expressions are a mask for a very different inner personality. It is not uncommon in child guidance to meet a boy whose voice and movements are strongly self-assertive, but whose drawings of cramped and distorted human figures reveal his deeper maladjustment and shrinking from normal social relationships. Allport, Walker and Lathers also consider that some of the personalities discovered in their sets of themes were compensations for their authors' true personalities.

The study of these problems of expression lies in the borderland between normal psychology and psychoanalysis (cf. Vernon, 45). Hitherto the experimental approach to personality through tests and ratings has been widely divorced from the clinical approach of the medical psychologist. Is it too much to hope that experiments such as those of Wolff, when scientifically checked by the matching technique, may bridge this lamentable gap, and lay the foundations of a new and more fruitful science of personality, or, as Wolff terms it, of "experimental depth-psychology"?

RESULTS OBTAINED BY MATCHING, AND POSSIBLE APPLICATIONS

Several of the results of matching experiments have already been mentioned, and we will only pick out a few of those contained in our table, below, for further discussion. A striking feature of the table as a whole is the generally high run of contingency coefficients which, as mentioned above, cannot be dismissed as spurious. The median figure from over a hundred experiments of 0.44 may be somewhat too favorable because the heterogeneity factor was usually not controlled. But it does suggest that we shall find closer relationships in the field of expression than previous correlational experiments have led us to expect; and that the negative conclusions of writers such as

Hull (62), Paterson (69), and Symonds (75) on the connection between external appearance and personality need to be modified.

It is interesting to compare the matching coefficient of $0.44 \pm .061$ for the validity of the Downey Will-Temperament test *profile* (XVII—a) with the average coefficient of $+0.13$ obtained in 5 correlational studies of the *separate* test scores (75, p. 348). Again the very high validity of $0.833 \pm .0315$ obtained in Vernon's matching experiments with the Rorschach ink-blot test (XVII—d) may be contrasted with the irregular and generally low coefficients obtained by correlating the abstracted Rorschach scores with other measures of traits and abilities. Admittedly neither of these comparisons is conclusive because the matching and the correlational experiments employed different subjects whose respective heterogeneities are unknown. But experiments have been carried out by Allport and Cantril (3) and by Vernon (44) where the judgments of the total personalities obtained by matching with sketches were much superior to judgments of isolated traits in the same personalities. Three different types of material were used in these experiments—voice, photographs, and manner while engaged on performance tests.

Allport and Cantril's figures (VIII—a-e) also illustrate the superiority of judgments of general traits to judgments of the more specific aspects of personality. The deductions of height, physical appearance, and handwriting from the voice are usually very poor; interests and vocations are somewhat better distinguished, general emotional traits better still, and the total personality (as described by summary sketches which incorporate all these partial features) is judged best of all. Again, an examination of Arnheim's numerous results shows that portraits of authors are better matched with general personality traits or sketches, or generalized descriptions of their style, than with specific expressions such as quotations from their works; and that full-face portraits reveal much more than silhouettes (I—a-e, II, V). Blake's comparative experiments prove that though "segments" of the body may express recognizable emotions, yet the whole body and face yield more complete expression (VII—c). It would be superfluous to point out the bearings of such findings on the question of consistency or specificity in personality organization (cf. 4).

A few additional matching experiments are omitted from the table, generally because sufficient quantitative data are unavailable. Harshbarger (25) found that photographs of the rhetorical gestures accompanying a public speech were successfully matched with the appropriate extracts from the speech. In Dashiell's (19) experiments a simple story was read to a group of children; the children were able to pick out from a series of photographs the emotional expression which went with each incident in the story. Patterson (33) selected sets of 7 poems, pictures, and unfamiliar musical compositions on the basis of apparent similarities of mood, and found that 40 judges generally matched the 3 types of material consistently. Saudek (38) and Meloun (31) describe

experiments where dishonest employees were picked from honest ones through graphological examination of their handwritings; and Roback (36) was able to identify the Jewish or non-Jewish authorship of a number of examination books from the style of writing. A very thorough matching investigation of the validity of the Rorschach test is planned by Rosenzweig (37). Husband and Godfrey's (26) study of the blindfold identification of several brands of cigarettes suggests that matching may find uses in other branches of psychology. The ability of his 51 judges to pick their own favorite brand from among 3 other brands corresponds to a contingency of only $0.14 \pm .10$.

Many other investigations in the field of expression have been carried out by allowing the judges to give their own interpretations of the material instead of presenting to them a controlled list of responses for matching with the material. While there are obvious psychological advantages in obtaining unrestricted judgments, it would be interesting to repeat such investigations under matching conditions in order to evaluate their results more objectively. We refer, for example, to Gates' (59, 60) and Sherman's (73, 74) work on facial and vocal expression of emotion, Roberts and Carmichael's (71) on expression by the hands, and Schäfer's (72) study of the recognition of gesture language by children.

The following is a list of some of the many additional problems which could be fruitfully studied by matching: the relative expressive value for personality of photographs of the profile, the full face, both views, of motion pictures, and of the actual living and moving person; photographs which are considered "good" or "bad" likenesses; various parts of the face (eyes, mouth, right and left side); the body or hands in movement without the head; the external appearance at various ages from infancy to senility; the manner or attitude of testees observed while doing performance tests; the clothes, furnishings of the person's rooms, and other characteristics suggested by Vance (79) and by Allport and Vernon (4); vocabulary and style of speech (as distinct from the voice itself), and other aspects of speaking suggested by Pear (70); the sounds made in walking, and in knocking at a door; handwriting with and without kymographic curves of point pressure.

Still other problems may be listed. The consistency of these modes of expression with one another, and the extent to which they reveal different aspects or levels of personality such as cognitive characteristics and aptitudes, interests and attitudes, general emotional traits, and deeper complexes; (the application of factorial analysis to these expressions might be feasible). Consistency of judgments of the same person at different ages (*e.g.* the extent to which impressions

of the total personality based on external appearance of infants agree with impressions obtained at various later ages). Similarities in modes of expression and in impressions of the personalities of twins and siblings. The influence of conditions such as volitional action, or self-consciousness, on expressive significance: *e.g.* impressions derived from normal gait contrasted with impressions of the gait when walking to catch a train; the voice before and after training in elocution; the voice in normal conversation, in reading a set passage, or in public speaking (N.B. the content of speech might be controlled by the use of a language unknown to the judges); spontaneous handwriting contrasted with copied script; correspondence between the temperamental characteristics of animals such as rats when eating and when running mazes. Consistency of, or changes in judgments after periods of acquaintanceship ranging from a few seconds upward. The relative merit of different graphological systems; *e.g.* analyses based chiefly on study of details contrasted with analyses based more on general intuitions.

Expressiveness of emotion at various ages: *e.g.* is it rather low in infants, rising to a maximum in pre-school children and then decreasing till maturity? (Descriptions of the situations which gave rise to the emotions should be employed, as in Goodenough's study, 24, rather than subjective names of emotions.) The universality of such expressiveness, *e.g.* the extent to which emotions can be identified in Americans, in Europeans, in orientals, etc.; this recognizability might correlate with the "social distance" of the race. The expressions of apes, other mammals and submammalian species matched, not with their hypothetical emotions, but with descriptions of the antecedent situations. Identification of emotions from the vocal expressions of animals, and from the generalized noises made by human crowds in various situations.

The psychology of art: the consistency of the style of artists (pairs of productions matched by experts who can use technical knowledge and by non-experts who judge by general impressions). Consistency of early with mature works, of poetry with prose productions, portraits with landscapes, and of the productions of artists who have worked in diverse fields (*e.g.* the paintings and poetry of Blake or D. G. Rossetti, the poetry and music of Campian or Wagner). Consistency of style with that of other members of the school to which an artist is said to belong. Connection between artistic productions and various levels or aspects of the personality of the artist; deductions of personality from an artist's "best" works

and from his inferior productions; the assistance or hindrance of a judge's technical knowledge of the art in deducing the personality. The expression of the personality of the performer as well as of the composer in music, and the obscuring of one by the other. The ability of music (*e.g.* Elgar's "Enigma Variations"), or of abstract designs, to portray personalities, emotions, and abstract ideas. The congruence of the facial expression of the audience with the type of music played or with the type of action seen on the stage.

TABLE OF RESULTS OF MATCHING EXPERIMENTS

In the experiments marked *, 2 or more sets of material were matched by the same judges; the P.E. of the judges for the *average* set is given. The true P.E. for the combined sets would be approximately \sqrt{m} times smaller. P.E.'s of the material are not given.

In experiments marked †, the number of judges (*n*) varied, or some judges failed to complete their matchings; the average effective number of judges is therefore quoted.

The numbers which follow the descriptions of Arnheim's experiments correspond to the numbering in his article.

All contingency coefficients are positive unless otherwise stated. The judges were generally university students, unless otherwise stated.

No.	Author	DESCRIPTION OF EXPERIMENT	Notation and <i>n</i>	S%	C and P.E.
1		<i>Facial Expression and Personality</i>			
a†	Arnheim (5)	Portraits of Leibnitz and Herbart matched with single character traits. Average of 3 experiments (Nos. 30-32).	1:2 33.7	80.2	0.52 ±.081
b†	"	Three portraits matched with single character traits; 5 experiments (Nos. 15-19).	1:3 39.4	84.7	0.74 ±.035
c	"	Portraits of 6 poets and philosophers matched with single character traits; 3 experiments (Nos. 36, 37, 43).	1:6 ?	40.9	0.55 ?
d†	"	Three of the same portraits matched with descriptions of their style of life (what they liked to drink, etc.). Experiments Nos. 38-41.	3:3 101.5	59.0	0.48 ±.030
e†	"	Portraits of 3 of Kretschmer's psychopathic patients matched with sketches. Experiments Nos. 74-75.	3:3 121.5	72.3	0.64 ±.018
f*	Vernon (43)	Five photographs of students and 30 personality traits, 6 to be assigned to each photograph.	6×5:5 48	33.3	0.32 ±.045
g	"	Character sketches based on these photographs, written by 48 judges, then matched with the photographs + "true" sketches by other judges. (Two sketches had to be matched with certain subjects, hence <i>t'</i> is greater than <i>t</i> .)	6:5 48	51.3	0.62 ±.025

No.	Author	DESCRIPTION OF EXPERIMENT	Notation and <i>n</i>	S%	C and P.E.
h	Vernon (44)	The same photographs matched with short character sketches by a different group of judges, namely adult convalescent hospital patients.	5:5 50	42.8	0.50 ±.036
i	"	Ten photographs (of relatively homogeneous subjects) matched with short character sketches by the same judges.	10:10 30	11.7	0.06 ±.042
j*	"	The same photographs matched in 2 sets of 5.	2×5:5 24	26.7	0.16 ±.066
<i>II Silhouettes and Personality</i>					
a*†	Arnheim (5)	Two silhouettes matched with single character traits; 10 experiments (Nos. 44-53).	1:2 77.9	66.2	0.31 ±.072
b*†	"	Two silhouettes matched with short character sketches; 4 experiments (Nos. 68-69, 72-73).	1:2 46.5	90.5	0.63 ±.050
c*†	"	Two silhouettes matched with 2 character sketches; 5 experiments (Nos. 54-55, 67, 70-71).	2:2 61.8	68.1	0.34 ±.079
<i>III Hands and Personality</i>					
a*	Binet (7)	Photographs of hands (back and palm) of 10 boys and 10 girls matched with sex by school teachers.	20×1:2 20	70.5	0.38 ±.133
b*	"	The same material matched with high or low intelligence.	20×1:2 20	54.0	0.08 ±.155
<i>IV Portraits and Vocation</i>					
a†	Rice and Waller (35)	Nine photographs matched with vocations by varying numbers of judges (139 to 158).	9:9 149.3	26.3	0.43 ±.019
b†	Vernon (43)	Twelve photographs similarly matched.	12:12 42.3	31.5	0.64 ±.023
c	Litterer (30)	Ten male photographs similarly matched.	10:10 150	32.2	0.60 ±.014
d	"	Eight female photographs similarly matched.	8:8 150	32.2	0.51 ±.018
e*†	Gahagan (23)	Photographs of men of (1) science, (2) letters, (3) politics, (4) business; 2 vocations matched at a time. Average of about 126 experiments where "intellectual" and "practical" vocations were contrasted, i.e. 1-3, 1-4, 2-3, 2-4.	31 or 32×2:2 15.9	69.5	0.36 ±.152
f*†	"	Average of about 63 experiments, where 1-2 or 3-4 were contrasted.	31 or 32×2:2 15.9	57.8	0.15 ±.174
g*	Vernon (47a)	Twelve sets of 6 photographs matched with vocations, either as 6:6, 3:6, or 1:6. The judges were mostly adult hospital patients.	6:6 etc. 27	41.4	0.55 ±.041
h*	"	Eight similar sets of 6, matched either as 3:3 or as 1:3.	3:3 etc. 27	53.3	0.39 ±.047

C and P.E.	No.	Author	DESCRIPTION OF EXPERIMENT	Notation and n	S%	C and P.E.
0.50 ±.036	V		<i>Facial Expression and Literary or Artistic Style</i>			
0.06 ±.042	a†	Arnheim (5)	Portraits of Leibnitz and Herbart matched with typical quotations from their writings. Average of 3 experiments (Nos. 1-3).	1:2 42.3	63.2	0.25 ±.110
0.16 ±.066	b	"	Portraits of 6 writers matched with extracts from their works; 3 experiments (Nos. 6-8).	1:6 ?	9.5	-0.19 ?
0.31 ±.072	c	"	Portraits of 3 poets matched with 3 verses. Experiment No. 5.	3:3 ?	42.7	0.19 ?
0.63 ±.050	d	"	Six portraits matched with descriptions of the writers' styles; 6 experiments (Nos. 23, 25-27, 34-35).	1:6 ?	55.2	0.72 ?
0.34 ±.079	e†	"	Three portraits matched with descriptions of literary style or artistic bent; 3 experiments (Nos. 20, 28-29).	1:3 42.0	73.7	0.65 ±.052
0.38 ±.133	VI		<i>Facial Expressions of Emotions</i>			
0.08 ±.155	a	Buzby (14)	Six Piderit model expressions matched with 18 names of emotions.	6:18 716	32.6	0.76 ±.005
0.43 ±.019	b	Vernon (43)	Nine Rudolf photographs matched with 18 names of emotions.	9:18 48	57.2	0.91 ±.006
0.64 ±.023	c	Vernon (47a)	George Washington Social Intelligence Test (Original Edition, Form 2); 12 pictures matched with names of emotions.	12:12 25	68.7	0.91 ±.005
0.60 ±.014	d	Goodenough (24)	Eight photographs of infant emotions matched with descriptions of 12 situations productive of emotion.	8:12 68	47.4	0.82 ±.015
0.51 ±.018	VII		<i>Other Modes of Expression of Emotion</i>			
0.36 ±.152	a	Vernon (43)	George Washington Social Intelligence Test (Revised Form, First Edition); 18 sentences representing emotional states matched with names of emotions.	18:18 50	71.2	0.94 ±.002
0.15 ±.174	b†	Kline and Johannsen (28)	Photographs of a woman expressing 20 emotions, either head+body, or face only. Average result of 4 matchings of the material.	20:20 50.75	48.7	0.89 ±.004
0.55 ±.041	c	Blake (8)	Photographs of a man expressing 9 emotions; various parts of the photographs matched with the names of the emotions.	<div> <div> Feet and legs only: Head and shoulders only without face: Torso and arms only: Whole body without face: Whole body with face: </div> <div> 44.2 51.1 65.2 80.0 90.8 </div> </div>	<div> <div> 9:9 95 </div> <div> 0.72 0.79 0.86 0.91 0.93 </div> </div>	<div> <div> ±.012 ±.009 ±.005 ±.002 ±.001 </div> </div>
0.39 ±.04	d	Schulze (39)	A dozen children were shown 13 pictures and photographed while looking at each one. Photographs of their expressions matched with the pictures by teachers.	13:13 2	92.3	0.96 ±.004

No.	Author	DESCRIPTION OF EXPERIMENT	Notation and <i>n</i>	<i>S</i> %	<i>C</i> and <i>P.E.</i>
e†	Wells (48)	Ten phonograph records matched with imaginative or dramatic names supposed to be descriptive of the music, by 23 listeners.	10:10 19.0	31.6	0.59 ±.042
f	Krauss (29)	Typical lines drawn by several subjects to represent "Joy, Sorrow, Rage, Twilight, Darkness, Iron, Gold, and Glass," matched with these names by a different group of judges.	8:8 242	68.2	0.86 ±.003
VIII <i>Voice and Personality, etc.</i>					
a*†	Allport and Cantril (2, 3, 15)	Three voices reading the same passage matched with the ages of the speakers, their height, and their complexion (<i>i.e.</i> physical characteristics). Average of 6 experiments with 4 different sets of speakers.	3:3 91.0	39.7	0.13 ±.042
b*†	"	Voices matched with appearance in photographs or appearance in person (after the reading); 9 experiments, 6 sets of speakers.	3:3 48.0	43.2	0.20 ±.058
c*†	"	Voices with political preferences, and with dominant values (<i>i.e.</i> scores on the Allport-Vernon <i>Study of Values</i>); 10 experiments, 7 sets of speakers.	3:3 60.8	45.5	0.25 ±.050
d*†	"	Voices with scores on (Heidbreder) Extraversion-Introversion, or (Allport) Ascendancy-Submission scales; 13 experiments, 7 sets of speakers.	3:3 67.3	47.3	0.29 ±.047
e*†	"	Voices with brief character sketches made up out of the above characteristics; 6 experiments, 5 sets of speakers.	3:3 50.3	54.5	0.41 ±.048
f*†	"	Average of 15 experiments in matching radio voices with various characteristics.	3:3 62.2	51.0	0.35 ±.046
g*†	"	Average of 15 corresponding experiments with normal voices.	3:3 57.4	58.0	0.46 ±.042
IX <i>Literary or Artistic Style and Personality</i>					
a	Vernon (47a)	Essays (written anonymously) matched by one psychologist with impressions of the subjects' personalities, which were derived from observing each subject engaged on performance tests for 45 minutes.	18:18 1	22.2	0.59 ±.153
b	Vernon (43)	Free designs, made up from squares and triangles of colored cardboard, matched with portraits+case studies of the subjects who produced the designs.	5:5 48	30.8	0.26 ±.046
X <i>Graphological Analyses and Personality</i>					
a*	Bobertag (9)	Graphological analyses of 5 writers by 6 graphologists, matched with the writers' personalities by 15 of their friends (educated adults).	6×5:5 15	80.7	0.84 ±.015

C and P.E.	No.	Author	DESCRIPTION OF EXPERIMENT	Notation and n	S%	C and P.E.
0.59 ±.042	b	Allport and Vernon (4)	Total results from matching various numbers of analyses (by 2 graphologists) with the personalities of the writers. Sum of 8 experiments by 1 judge.	23:23 to 7:7 1	15.9	0.28 ±.077
0.86 ±.003	<i>Handwriting and Personality</i>					
	XI					
	a*	Binet (6)	Eleven pairs of handwriting specimens, each pair representing a criminal and a man of good character, sorted by graphologists.	11×2:2 3	66.7	0.32 ±.260
0.13 ±.042	b	Cantril and Rand (16)	Handwriting specimens of 6 subjects (in a group of 60) who obtained outstanding scores on the Allport-Vernon <i>Study of Values</i> , matched with their test results by "laymen" (non-graphologists).	6:6 26	18.3	0.04 ±.056
0.20 ±.058	c	"	The same material matched by graphologists.	6:6 26	63.3	0.78 ±.018
0.25 ±.050	d	Arnheim (5)	Handwritings matched with short character sketches (Experiment No. 42).	4:4 44	68.8	0.71 ±.021
	e	Powers (34)	Handwriting specimens matched with detailed personality sketches by laymen.	10:10 168	17.7	0.25 ±.019
0.29 ±.047	f	"	The same material matched by graphologists.	10:10 17	24.1	0.43 ±.059
	g	Allport and Vernon (4)	Handwriting specimens and kymograph curves of point pressure matched with thumbnail character sketches by laymen.	4:4 32	43.0	0.38 ±.056
0.41 ±.048	h	Vernon (43)	Handwriting specimens matched with photographs+case studies of the writers, by laymen.	5:5 48	32.9	0.31 ±.045
0.35 ±.046	i*	Theiss (41)	Two or three scripts matched with thumbnail character sketches by persons of various ages. Five sets were matched by each judge. Selected results are presented.	Notation C.A. n S% C P.E. { 7 79 56.7 0.13 ±.078 9 65 66.5 0.31 ±.079 5×1:2 { 11 83 71.8 0.40 ±.063 13 62 74.2 0.44 ±.070 15 88 76.1 0.46 ±.056 17+ 90 76.2 0.46 ±.055 { 7 79 51.5 0.36 ±.071 9 65 53.8 0.40 ±.075 5×1:3 { 11 83 56.1 0.44 ±.062 13 62 64.5 0.56 ±.058 15 88 70.4 0.62 ±.040 17+ 90 66.3 0.58 ±.046		
0.59 ±.153						
0.26 ±.046						
	XII					
			<i>Handwriting and Intelligence</i>	Notation and n	S%	C and P.E.
	a*	Binet (6)	Pairs of handwriting specimens, each pair representing a writer of superior intelligence and a mediocre person, sorted by graphologists.	36 to 23×2:2 7	76.8	0.47 ±.136
0.84 ±.015	b*	"	Similar specimens, shuffled together. Two results according to the dividing line between intelligence and mediocrity.	62×1:2 3	{ 74.7 0.44 81.3 ±.313 0.53 ±.262	

No.	Author	DESCRIPTION OF EXPERIMENT	Notation and n	S%	C and P.E.		
c*	"	Handwriting specimens (addresses) written by 40 bright and 40 dull children, sorted by school teachers.	80×1:2 16	64.6	0.28 ±.182		
d	"	Addresses written by 7 superior and 7 mediocre adults, sorted by adults (not graphologists or teachers).	14×1:2 ?	50.0	0.00 ?		
XIII <i>Handwriting and Other Modes of Expression</i>							
a	Von Foerster (22)	Handwritings matched with visual and aural impressions of the writers (who were present in person during the matching, and who each read aloud a short passage).	8:8 25	24.5	0.34 ±.052		
b*†	Arnheim (5)	Handwriting specimens matched with portraits of the writers. Average of 2 experiments (Nos. 9-10).	3:3 50.5	45.4	0.25 ±.055		
c	"	Handwritings of Leonardo da Vinci, Raphael and Michel Angelo, matched with the names of the writers. Experiments Nos. 13-14.	3:3 143	67.6	0.59 ±.020		
d	"	Handwritings of Wagner, Schiller, and Freytag matched with portraits of the writers. Experiments Nos. 11-12.	3:3 137	77.0	0.68 ±.015		
e*†	Allport and Cantril (3)	Handwritings matched with the voices of the writers, who read the same passage. Five experiments with 5 different sets of speakers.	3:3 43.4	37.5	0.09 ±.060		
f	Wolff (49)	Handwritings matched with phonograph records of the voices of the writers.	3:3 70	53.3	0.39 ±.042		
g	"	Handwritings matched with <i>Nacherzählungen</i> (i.e. retellings of a story by the writers).	3:3 78	52.6	0.38 ±.040		
XIV <i>Handwriting and Sex. (Notation of all the following experiments = 1:2.)</i>							
a*	Binet (6)	Handwritings sorted by graphologists according to the sex of the writers.	m 180 or 103	n 2	S% 77.4	C 0.48	P.E. ±.361
b*	"	Similar specimens (addresses) sorted by laymen.	137	10	69.8	0.37	±.190
c*	Downey (20)	(The following experiments were all similar. Laymen were used as judges, and the specimens were either addresses or sentences that were identical for each writer.)	200	13	67.3	0.33	±.175
d*	Newhall (32)		200	92	57.3	0.15	±.073
e*	Kinder (27)		100	20	68.4	0.35	±.138
f*	Von Foerster (22)		8	25	62.5	0.24	±.134
g*	Arnheim (5) (Experiment No. 21).		4	28	64.0	0.27	±.126
h*	Broom, Thompson and Bouton (13)		40	24	68.0	0.34	±.127
i*	Young (50)		50	50	61.0	0.21	±.096
j*	Tenwolde (40)		40	29	63.0	0.25	±.124
XV <i>Congruence of Different Parts of the Body</i>							
a	Wolff (49)	Photographs of hands matched with silhouettes of profiles.	Notation and n 60	S% 40.0	C and P.E. 0.14 ±.05		

C and P.E.	No.	Author	DESCRIPTION OF EXPERIMENT	Notation and n	S%	C and P.E.
0.28 ±.182	b	Vernon (43)	Four photographs of bodies (with heads removed) matched with 5 photographs of heads; (the latter were taken at a different time, when different clothes were worn).	4:5 48	38.5	0.42 ±.046
0.00 ?	XVI	<i>Reliability of Handwriting, Literary Style or Drawing; and Sibling Resemblance</i>				
0.34 ±.052	a*	Von Bracken (12)	Sentences written by 720 children (6-10 yrs.) on 4 different occasions; 6 judges matched 8 sets of 15 each. Average result per set, representing the reliability of handwriting over the following intervals of time.	1 day 3 months 6 months 15:15 1	92.1 65.6 55.7	0.96 ±.003 0.92 ±.020 0.89 ±.033
0.25 ±.055	b*	Allport <i>et al.</i> (1)	Eight themes written by 70 students matched with one or more other themes by the same authors. Two judges matched groups of 5 authors at a time. Average result of 112 experiments.	5:5 2	50.2	0.60 ±.142
0.59 ±.020	c*	Vernon (47)	Pairs of drawings of a house and a man by 490 children (10-13 yrs.), arranged in 70 sets. Each set matched with a time limit of 30 seconds by educated adults. Average result.	4:10 10	31.9	0.59 ±.062
0.68 ±.015	d	Thorndike (42)	Seventy-two pairs of handwriting specimens written by siblings, matched by 12 judges.	72:72 12	6.71	0.41 ±.041
0.09 ±.060	XVII	<i>Validation of Downey Will-Temperament and Rorschach Ink-Blot Tests</i>				
0.39 ±.042	a	Downey (21)	Will-Temperament profiles of 12 subjects identified by 12 of the subjects' friends.	12:12 12	22.0	0.44 ±.061
0.38 ±.040	b†	"	Sets of 3 heterogeneous W-T profiles matched by friends with one of the subjects; total result of 163 matchings.	?×1:3 ?	72.3	0.64 ±.027
P.E. ±.361	c†	"	Sets of 3 homogeneous W-T profiles similarly matched; 160 matchings.	?×1:3 ?	41.3	0.17 ±.055
±.190	d	Vernon (45)	"Blind" diagnoses of the personalities of 45 subjects, based on Rorschach protocols, matched in small groups (3:3 to 10:10) with independent personality sketches by one or two psychologists. Total result.	Various	65.5	0.83 ±.032
±.175	XVIII	<i>Miscellaneous</i>				
±.073	a	Vernon (44)	Character sketches of subjects, based on their manner at performance tests, were written by 3 experimenters, A, B, and C. A then tried to identify B's and C's sketches, B and C to identify A's. Summed results.	25:25 or 20:20 3	23.3	0.72 ±.055
±.138	b†	Vernon (43)	"Congruence Test." Judges were given 9 sets of 5 'incidents' (including test scores, probable vocations, quotations from essays, etc.). They had to sort out all the incidents into 5 "congruent" groups. Thus each set was, in effect, matched with 8 other sets.	9×5:5 45:5	34.4	0.34 ±.045
±.134						
±.126						
±.127						
±.096						
±.124						
C and P.E. 0.14 ±.05						

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THE PSYCHOLOGY OF LANGUAGE *

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A growing interest in the psychology of language is apparent today, perhaps more on the continent than in America. Writers in numerous fields—philology, anthropology, sociology, logic, epistemology, the psychology of thought, child psychology, and social psychology—have been led into consideration of the subject for one reason or another. One can especially detect a growing “language consciousness” in relation to scientific work, a tendency to examine carefully the possibilities and pitfalls of linguistic symbolism, as evidenced, for example, in the new-found popularity of Jeremy Bentham, in the writings of Pareto and Ogden and Richards, and in the recent logical positivist and operationalist movements.

An attempt is made in the present article to trace the principal lines of current investigation.¹ There is as yet no established and generally accepted definition of the field that this subject covers. We shall here consider it to embrace all material having to do with the following topics: (a) the nature of language, so far as it is treated by psychological analysis; (b) the development of language, in both its phylogenetic and ontogenetic aspects; and (c) the significance of language for social psychology. The three main sections of the article will be devoted to these three subjects respectively. Because of considerations of space, it will not be possible for us to enter into a discussion of various specialized problems, such as gesture language, bilingualism, and language learning.

I. THE NATURE OF LANGUAGE

A. *Theoretical Considerations.* There has been little agreement as to what language is. For Plato (110) it was a set of signs used

* The author is indebted to Professor G. W. Allport for criticism in the preparation of this article.

¹ For other recent surveys differing considerably from this in approach, see Esper (40), and Adams and Powers (1); also *Psychologie du Langage* (Paris: Félix Alcan, 1933), consisting of reprints from the *J. de Psychol.*; likewise the addresses on *Sprachtheorie* in the *Proceedings of the Twelfth Congress of the German Society for Psychology* (65).

as an instrument to *name* things and thereby convey information from one person to another. Wundt (156) considered language to be *expression*, its function to express mental content; communication he considered merely an incidental by-product. Croce (27), holding this view and regarding art also as expression, has identified the Linguistic with the Aesthetic. The *communication* of mental content, on the other hand, is considered in a third type of view (probably the most popular) to be the peculiar function of language. Pillsbury and Meader (109), for example, define language as "a means or instrument for the communication of thought, including ideas and emotions." G. Stern (129) notes that Marty regarded language in a fourth way as a form of activity whose chief purpose is to *evoke* psychic phenomena in other persons. A fifth view, of a social-behavioral nature, which has become popular recently (due chiefly to De Laguna's effective exegesis of it, 33), conceives of language as essentially a *tool* for social coördination and coöperative action. Many modern writers have defined language by a *plurality* of functions. For example, Paulhan (102) states two functions as constituting the essence of language (signification and suggestion), Bühler (17) gives three (representation, expression, and appeal), G. Stern (129), four (the symbolic, expressive, communicative, and effective functions), and Ogden and Richards (94), five (symbolization of reference, expression of attitude toward listener, expression of attitude toward referent, promotion of effects intended, and support of reference).

As a theoretical framework for discussion, we shall here embrace a triplex conception of language, following an approach that is made implicitly in Plato (110) and explicitly in Bühler (17) and Gardiner (46). A speech phenomenon, such as produced when a person says "It is raining" may be considered in 3 relations: in relation to the person who produces it; in relation to the person or persons who hear it; and in relation to the objective fact or situation that is represented through it (as here the meteorological fact of rain). We shall call these 3 relations (or functions) respectively *Expression*, *Evocation*, and *Representation*. They are similar to Bühler's (17) three functions, *Ausdruck*, *Appel*, and *Darstellung*. Bühler's interest, however, is not in the social-psychological situation, but simply in the speech phenomenon itself, from which he derives these 3 functions as "abstractive moments"; his theoretical considerations, therefore, differ somewhat from the ones to be employed here. Gardiner (46) stresses the 4 factors that lie at the poles of the 3 functions (the

"speaker," the "listener," the "words" and the "things"). He points out that much linguistic theory has neglected the "listener" and even more the "things." The truth of this last observation can be seen from the theories mentioned at the beginning of this section.

Representation, unlike Expression and Evocation, is not a causal relation but a symbolic relation, established by social convention. It is a genuine relation only in so far as members of a given speech community produce and react to a speech phenomenon as a substitute for an objective fact. Since Representation is thus based upon convention, not all of the speech phenomenon is relevant for it, but only those features that are conventionalized (the "formal" features or the "linguistic forms"), features which appear, for instance, in all specific utterances of "It's raining." Features that depend upon the particular occasion of speech usage, such as the intensity and speed of utterance, the particular local accent, the personal tone of voice of the speaker, and the like, do not belong to Representation. The total body of conventionalized formal features which may operate in Representation will be referred to as the "structure of language."

Different modes of Expression and Evocation may be distinguished. First there is Expression through linguistic forms resulting from the cognition or thought of the objects, events, or facts which by convention these forms represent.

Thus a person becoming aware of the fact of rain may produce the words "It's raining." This is a formal, objective, intellectual mode of Expression. There is a corresponding mode of Evocation in which the linguistic forms arouse cognition or thought of the objects, events, or facts which they represent. Thus the words "It's raining" may arouse thought of the fact of rain in the hearer. This evocation of cognition or thought is also called the "understanding" or "comprehension" of speech.

A second mode of Expression may be observed when the appearance of particular linguistic forms is determined chiefly by emotions, feelings, or attitudes rather than by thought or cognition.

As an extreme case, a person may become aware that it is raining and react with profanity. Other examples can be seen when one child calls another "names," or when an orator selects his words not according to facts but according to the way he feels about matters. In the corresponding mode of Evocation the words arouse emotions, feelings, or attitudes rather than cognition or thought, as when a person is strongly affected by profanity or "names," or when a listener reacts to a political address with a great deal of feeling but with little thought or understanding. In so far as this second subjective mode of Expression and Evocation becomes dominant, the function of Representation falls away; for here the convention that lies at the very basis of Representation,

the convention that individuals produce and react to certain linguistic forms as standing for certain objects and situations, is being disregarded. Representation goes hand in hand with the intellectual, objective mode of Expression and Evocation.

The difference between these 2 modes has been remarked by a number of writers. Max Müller (87) speaks of "rational" and "emotional" language, J. Marouzeau (82) of "intellectual and affective" language, Ogden and Richards (94) of the "symbolic" and "emotive" use of words, and Feigl (44) of "cognitive" and "emotive" meaning.

A third mode of Expression and Evocation may be termed the "material" mode.

Here we are concerned with those features of the speech phenomenon that are not formal and conventionalized, and therefore have nothing to do with Representation. An angry tone of voice, for example, expresses a state of mind of the speaker and has certain effects upon the hearer (such as arousing fear), but is not formal and representational.

So-called "animal language" is apparently limited entirely to material Expression and Evocation.² Most investigators agree that while animals are capable of producing vocal articulations, some having very large repertoires (123, 124), and of being affected by such, they have no formal units in their utterances which represent by convention various objects or facts of the external world and which are voluntarily produced on occasion for such Representation. Yerkes (157), for example, writes in respect to the vocal sounds of anthropoids, "Everything seems to indicate that their vocalizations do not constitute true language. . . . Apparently the sounds are primarily innate emotional expressions." The absence of formal units and Representation in animal utterance, however, it may be explained—by an inability to imitate sounds, by lack of proper social conditions, by lack of brain capacity—obviously constitutes a wide gulf between animals and man, and is responsible for the famous dictum of Max Müller (87) that "Language is our Rubicon, and no brute will dare to cross it."

B. *The Structure of Language.* We have already noted that only certain abstract and conventionalized features of the concrete speech phenomenon are significant for Representation, and that the total body of such features constitutes the structure of a language. The smallest units of distinctive significance are called "phonemes" (roughly corresponding in English to the vowels and consonants), and the study of them "phonology." This is contrasted with "phonetics," or the study of speech sounds in their concrete totality.

Trubetzkoy (141) and Sapir (120) have recently discussed the nature and significance of the phonemes. There are numerous other linguistic units—

² For recent discussions of animal language, see Delacroix (30), Bierens de Haan (8), and Schwidetzky (125a).

morphemes, words, grammatical forms, sentences, and the like. A detailed analysis of them is given by Bloomfield (9), and more general discussions by Bühler (17) and Gardiner (46). Ries (112) has devoted a volume to the sentence, listing 140 various definitions that he has assembled. We shall in this section discuss only a few of the more peculiarly psychological problems related to the structure of language.

1. *Acoustic Analysis of Forms.* The question as to what distinguishes the various vowels has been of long-standing interest to psychologists, and is by no means settled today. While there is general agreement that vowels differ in having different characteristic resonant pitches (laryngeal pitches cannot very well be conventionalized), opinions are at variance on the following questions: whether the vowel tones arising from resonance in the oral cavities are reinforced overtones of the fundamental laryngeal tone or are produced independently and merely "carried" by the laryngeal tone (the harmonic *vs.* the inharmonic theory); whether the different vowels are distinguished by 1, 2, 3 or more characteristic resonant pitches; and whether other factors enter to characterize the individual vowels as well as resonant pitches from oral cavities.

Köhler's claim (69) that the characteristic pitches of the different vowels range themselves in an octave series is well known, but does not yet seem to be verified.³ Miller (85) claims that some vowels have 2 characteristic pitches, and Stumpf, according to Pillsbury and Meader (109), argues that a few have 3. A theory of double resonance is advanced by Paget (97), according to whom the oral-nasal space is so divided that it produces a distinct pair of resonances. Russell (116) believes that surface effects are important in vowel qualities, the hard surfaces of the front of the mouth giving a sharp, metallic quality to the front vowels by emphasizing upper partials of the laryngeal note and by creating independent high-pitched friction tones, and the soft surfaces of the back of the mouth having an opposite effect. Gemelli and Pastori (48) claim that each vowel is determined not only by its harmonic character, but also by the respective values of the phases of the different components at the beginning of each period. A further discussion of recent investigations can be found in Kucharski (71).

Consonants, except those which, like vowels, are musical sounds (*l*, *n*, *ng*, and *m*), are readily described as different types of noises (9), but they are more difficult to subject to acoustic analysis. Paget (97) has done some recent work on this problem. Investigations of the tonal configurations of words and phrases have been made by Gemelli and Pastori (49).

2. *Quantitative Analysis of Forms.* A novel approach to the structure of language has been recently made by Zipf (159), employ-

³ See recent discussions of this theory by Engelhardt and Gehrcke (38) and by Huber (58).

ing statistical analysis of the frequency of the occurrence of various structural units (phonemes, morphemes, words, phrases). Since his work is reviewed elsewhere in this issue of the BULLETIN, we need not enter into a discussion of it here.

3. *External Structural Relations.* The question of what relation the structure of language, particularly in the form of words and grammatical categories, has to physical and mental "reality," is an old one in philosophy. Heraclitus and his followers, Cornford (26) writes, were convinced that "the structure of man's speech reflects the structure of the world," and is "an embodiment or representation of it." A famous dispute in scholastic philosophy revolved about the relations of name-words to reality. Nominalism denied any corresponding objective realities to general terms by calling the "universals" mere names, while realism, in its extreme form given by William of Champeaux, denied any corresponding objective realities to particular terms by calling "individuals" mere names (149). Bühler (17) makes the interesting observation that a nominalism which regards "universals" as unreal abstractions while considering the names to be real is guilty of linguistic naïveté, since names as linguistic forms are likewise abstractions from concrete sound phenomena. "Conceptualism" provided a fairly satisfactory solution to the nominalist-realist argument by contending that the realities corresponding to general terms are ideas or concepts in the minds of users of the languages, but modern behaviorism appears to resolve even these concepts into words (or better, into linguistic reactions) by maintaining that thought is merely internal speech.

An interesting study dealing with this problem has been made recently by Allport and Odbert (4). They compiled from the English lexicon a list of 17,953 names that have reference to personality. In what relation do these many trait-names stand to actual traits of personality? The authors conclude that although traits of personality must be regarded as actual psycho-neural structures, the trait-names are at best mere "range-names" symbolizing *similar* structures of an essentially individual and personal order.

As is the case with words, the external relations of the grammatical categories have been a source of long dispute. Many ancient philosophers, including Aristotle, believed in a parallelism between grammatical categories, categories of reality, and mental or psychological categories. Modern philosophers, like Bergson (7) and Whitehead (152), however, tend to deny a correspondence between the first two types of categories. Whitehead (152) quotes with approval a passage from J. S. Mill condemning the Greeks for blindly classifying nature on the basis of grammatical distinctions in their language. Modern

philologists, and especially those of the neo-grammarians school, likewise object to such a correspondence. Bloomfield (9) rejects all definitions of the grammatical categories in terms of objective meaning (*e.g.* the definition of nouns as names for things) and argues for purely formal definitions. The question of the relation between the grammatical and psychological categories has never been satisfactorily settled. General opinion seems to follow Paul's view (101) that "Every grammatical category is produced on the basis of a psychological one," but that the original harmony between the two has been disturbed. Malinowski (79) has offered a fairly popular explanation of grammatical structure as mirroring "the real categories derived from practical attitudes of the child and of primitive or natural man to the surrounding world."⁴

C. *Representation.* Representation is the relation between speech signs in usage and the objects, events, or situations for which they stand as substitutes. We shall now enter into a closer examination of this relation.

1. *Representation Through Similarity.* When we come to ask how language "represents," a possible answer is through *similarity*, as a picture represents an object or situation by resembling it. However, this is not possible, to any great degree, with language. The pictorial powers of a language are very much restricted by its established syntax, lexicon, and set of phonemes. Yet there is still left a certain space for similarity to operate. Its appearance here is apparently the source of a dispute coming down from the days of Plato and Aristotle as to whether the relation between words and the objects or events that they represent (their "referents") is entirely arbitrary and conventional, or whether there may not be some natural connection involved, some intrinsic adequacy of the words to their referents. It seems most adequate to say that the representational relation is essentially a matter of convention, but that similarity may be a factor of greater or less importance in determining whether a particular form shall be established by convention to represent a particular referent, and whether it shall continue with enhanced survival-value so to function.

a. *Onomatopoeia.* The best example of a similarity relation is found in onomatopoeia. Here the speech-sounds imitate certain familiar sounds of experience and symbolize either these sound-events themselves or the characteristic sources of the sounds. The imitation, however, is always only a greater or less approximation, never

⁴For other recent discussions of the nature and relations of the grammatical categories, see Jespersen (62), Sapir (117), Vendryes (144), Pillsbury and Meader (109), Jordan (64), Pichon (108), and Appendix A in Ogden and Richards (94).

an exact reproduction. Grammont (53) has given a thorough treatment of onomatopoeia, including a detailed discussion of the onomatopoeic significance of the various vowels and consonants. He stresses the manner in which linguistic habits determine the form of onomatopoeic imitations. The sound, for example, that is represented by the French word *cou-cou* is more nearly *ou-ou*; but the "c's" are added because it is not customary in French (nor in English) to speak two such vowels without consonants. As the result of another linguistic habit, when an onomatopoeic word imitates a sound that varies slightly, as the ticking of a clock, the successive vowels always follow each other in a direction from the clearest *i* to the most somber *ou*. The clock goes *tick-tock* but never *tock-tick*.

b. *Phonetic Symbolism*. Besides actually imitating physical sounds to a degree and having thus a relation of auditory similarity with objects and events, the speech-sounds appear sometimes to have connections with referents by virtue of the dimensions in which sounds vary. Here it is a matter of similarity across modalities. Jespersen (61) has given many examples of cases where the vowel *ɪ*, especially in its narrow or thin form, serves to indicate what is small, slight, insignificant, or weak, while the vowels *a*, *o*, and *u* tend to indicate what is large, heavy, and massive.

Sapir (119) conducted an experimental study of the phonetic symbolism of the vowels *i* and *a*. He used 60 pairs of meaningless stimulus words of the type "mal," "mil," asked his subjects which represented the larger and which the smaller variety of an arbitrarily selected object, such as a table, and in general found around 80% of the responses favoring *a* as larger than *i*. In a second experiment Sapir first assigned an arbitrary meaning to a nonsense word, as *mila*=brook, then changed the vowel and asked what change there was in the meaning. The results were of the same nature: *mila*, for example, would be judged "a smaller brook"; "mola," "the ocean at night."

In 1933 Newman (89) published the results of a more elaborate investigation involving a large number of vowels and consonants. His method, like Sapir's, was to present 2 nonsense words, differing in one phoneme, and ask his subjects which represented the larger of an arbitrarily selected object, (*e.g.* *glupa*, *glopa*—which is the larger horse?). He found that with reference to size the vowels arranged themselves in the following ascending order: *i* (*fini*), *e* (*été*), *ɛ* (*met*), *ä* (*hat*), *a* (*Mann*), *u* (*put*), *o* (*tot*), *ɔ* (*note*). The differences between *i* and *e* and between *ɛ* and *ä* were consider-

able, between *e* and *ɛ*, *ä* and *a*, and *u* and *o* slight, and between *a* and *u* and *o* and *ɔ* very slight. The order in this "scale of relative symbolic magnitude" corresponds in general, according to Newman, to a vowel series following (1) the receding positions of articulation made by the tongue within the mouth, (2) the decreasing frequencies of characteristic high vocalic resonance as measured acoustically, and (3) the increasing size of the oral cavity as used in pronunciation. In a second experiment Newman found that vocalic length (duration) also acted as a factor in magnitude judgments.

Bentley and Varon (6) object to the conclusions of Sapir and Newman about "feeling of significance" and "symbolic reference" in sounds, arguing that the judgments of their subjects were forced and were merely judgments upon variations in the attributes of sound. They found that when three trained subjects were presented with nonsense syllables, such as "zat," "riv," "fim," and asked to give synonyms or otherwise express the meaning, their responses showed no evidence of phonetic symbolism; but when a method similar to that of Sapir and Newman was used, similar results were obtained.

The chief basis of phonetic symbolism very likely lies, as Bentley and Varon suggest, in the tonal attributes of the vowel sounds. It is fairly well established experimentally that volume is an attribute of tones, and that it varies directly with loudness and inversely with pitch (130). Brightness also characterizes tones, but appears to be the same function as pitch, a high pitch being bright, a low pitch dull. Most investigators of vowels agree that the different vowels are characterized by different resonant pitches, as we have seen, and can therefore be arranged approximately in an ascending order according to their characteristic resonances. Hence vowels as musical sounds differ in brightness and in volume (assuming a constant loudness). The brighter or more voluminous vowel is felt to represent adequately the brighter or larger of two things.

However, as a consideration of common words such as those listed by Newman readily shows, not every small referent is felt as demanding a small-volumed phoneme in the word that represents it, and not every small-volumed phoneme is experienced as suggesting smallness in the referent of the word in which it appears. Phonetic symbolism in the case of size appears to operate only when the characteristic of largeness or smallness is dominant and distinctive in the referent, *i.e.* primary in attention, and only when the symbolic vowel in the word is likewise made primary in attention. This is achieved essen-

tially through contrast, which makes the feature to be emphasized the chief basis of discrimination. Symbolic vowels can also apparently be brought out by repetition, *i.e.* contrast with the general mass of speech experience, as in such expressions as "teenie-weenie." Only when the above conditions are fulfilled does it seem that one may properly speak of "phonetic symbolism" in the case of size. The same argument holds, of course, for dark-brightness symbolism. These conditions are fulfilled in a number of actual language usages so that phonetic symbolism is not entirely an artifact of the experimental situation. They were obviously fulfilled in the experiments by Sapir and Newman, but not in those by Bentley and Varon, where the vowels in singly presented forms such as "riv," "zat," "lel" were imbedded in sound configurations and not made distinctive, therefore not suggesting volume or brightness.

c. *Morpheme and Word Symbolism.* One would expect that the total sound configuration in time of a word or a morpheme (the smallest meaningful unit in a language, commonly a syllable or simple word), might occasionally be similar to the configuration of the referent (have a similar *Gestaltqualität*) and the morpheme or word thus appear naturally symbolic. A quick, brief movement, for example, is felt as naturally represented by the quick, brief sound of the word "zip," which may be due to a configuration of quick auditory movement in this sound unit, beginning as it does with the low pitch of *z*, going quickly up with *i*, and abruptly ending with *p*.

Usnadze (143) made an interesting study in which subjects were asked to select for each of 6 meaningless drawings the most appropriate name from a list of 42 syllables. The agreement of the subjects in respect to matching sound and picture was far greater than probability would allow. Tsuru and Fries (142) have shown that Japanese words are symbolically suggestive to some extent. They presented 2 Japanese words and 2 English words with corresponding meanings to English subjects, and found that the subjects could guess which English word belonged to which Japanese word 25% more frequently than chance would allow. No analysis was made; but one can see in the word "Kaku," for example, a configuration which would make it appear more adequate to the meaning "square" than to "circle."

In a recent book entitled *Grundfragen der Sprachphysiognomik* H. Werner (151) has approached the matter of word symbolism in a novel manner. There are, according to Werner, two kinds of perception of the world, "mechanistic" and "physiognomical" perception. The former is the scientific, analytic mode. The latter, the mode of primitive man and of children, is characterized by an apprehension of the organic nature of a thing, a quick grasping of its essence or soul. Language perception belongs to the latter mode, and the word has, Werner believes, a physiognomy which conveys the essence of the thing it represents. Werner's subjects, for example, extracted

from the German word "Seife" all the features which characterize the thing "Seife." It is a question, however, how much Werner's findings were a function of the experimental *Aufgabe*, which might influence a subject to find in a complex sound-mass something expressive of pretty nearly anything.

2. *Gesture Theories.* Not only direct phenomenal experience of the speech sounds, but also kinesthetic experience is often proposed as the basis of natural Representation. Newman (89), as we have seen, correlated his scale of symbolic magnitude with the different sizes of the oral cavity and different positions of the tongue, as well as with characteristic resonance. Paget (97) has carried this sort of theory to an extreme, claiming that even the origin and development of all language itself is based upon certain positions and movements of the tongue, jaws and mouth, which instinctively imitate the events and objects of the outside world. The speech-sound coming from a particular imitative oral gesture evokes the same gesture in the hearer and thereby symbolizes the referent of which the gesture is an imitation. Paget collected from Skeat's *Etymological Dictionary of the English Language* 60 Aryan roots in which the oral gesture required to produce the word "appeared to have a symbolic or pantomimic relation to meaning"; for example, in the roots "kar," meaning "curve" or "roll," which is made by a curving or rolling motion of the tongue, and in "skag," meaning "shake," where there is the grip (*s*) followed by a reduplicated movement (*k* and *g*) at the other end of the tongue.

While one may be skeptical about imitative vocal gestures of the above sort, there are doubtless many *expressive* vocal gestures (mixed up by Paget with the above), which have been instrumental in the formation of numerous words—as, for example, the sudden expulsion of air with strong disapproval, seen in "bosh," "bunk," etc. In such cases, however, there is no immediate connection of similarity between the speech-form and the referent. It is here rather a question of an association based on contiguity between the emotionally expressive gesture and the referent evoking it.

There are numerous other cases where a natural connection is felt but where it is derived solely from experience of contiguity in the past. This is probably especially true of many of the consonant groups to which some philologists ascribe a pure natural symbolism. For example, "fl" appears to have the meaning of "alternating movement" in words like "flit," "flap," "flutter," "flicker," etc. Such cases may be easily products of chance. Several words having a similar sound component in common may also happen to have an element of meaning in common, and the sound component comes in

time to be felt as representing the element of meaning and is extended to new forms containing it. Indeed, Wolffe (155) claims that all sound symbolism is merely a generalization of what appears by chance in several forms with similar meaning.

3. *Bühler's Theory of Representation.* Karl Bühler's recent book *Sprachtheorie: Die Darstellungsfunktion der Sprache* (17) is expressly devoted to the function of Representation, and is the most complete account of this aspect of language available. Two fields are of paramount importance in Bühler's theory, the *demonstration field* (*Zeigfeld*) and the *symbol field* (*Symbolfeld*). The demonstration field is the field in which speaker and hearer are oriented during speech. It is like the field of orientation in which a traveller stands when he sees a sign-post and interprets it correctly. With the demonstration field are associated the demonstration words (*Zeigwörter*), words such as *I, here, there, now, then, yesterday, this, that, right, left*, which can be used only in this field and acquire significance only through it. At the center of the demonstration field lie the words *I, here, and now*. There are 2 methods of demonstration in this field: direct perceptual (*Demonstratio ad Oculos*), involving the actual perceptual surroundings of the speaker and hearer; and imaginal (*Deixis am Phantasma*), involving a common imaginal background possessed by the speaker and hearer.

The symbol field refers to the context of linguistic factors in which a symbol appears. Bühler distinguishes 2 important kinds of factors in the symbol field, the ordinary syntactical factors (declension forms, position, modulation, etc.) and the material aids (*Stoffhilfen*). The latter refer to certain "spheres" which words carry with them and which are guides to the interpretation of other words, as the word "radishes," for example, carries the sphere of a dining table or garden with it. To demonstrate the importance of the material aids, Bühler cites an experiment from C. Bühler in which the words of sentences were jumbled up and practically all syntactical aids destroyed; yet by means of the spheres of the individual words, the subjects were often able to reconstruct the sentences and gather the intended meaning.

Through the field-values accruing from the surrounding fields, each word is made more precise and more adequate to the given occasion of Representation.

How is a group of language symbols coördinated to a situation so that the situation can be re-presented through them? We have already noted that speech representation is not pictorial and direct.

It is rather mediated and indirect. The mediation and coördination are achieved, according to Bühler, through certain devices in the symbol field, which he calls *Feldgeräte*. The outstanding example in the Indo-Germanic languages is the case-system, which, according to Bühler, interprets the events and situations of the external world from a particular point of view, through a scheme of action (human and animal). How is it possible that a field-device involving an action scheme can be used in the representation of such a diversity of events and situations, many having little to do with action? It is because here the demonstration field enters to provide a basis of interpretation and understanding, a guide for the operation of the field-devices of the symbol field.

D. *Expression*. Expression has been defined as the causal relation between the speaker and the speech phenomenon. We may divide our discussion of Expression into formal Expression and material Expression, corresponding to the formal and material features of the speech phenomenon.

1. *Formal Expression*. Paul (101) argued that a sentence expresses the synthesis of several ideas or groups of ideas while Wundt considered the process of sentence formulation to be one of analysis of a total idea. Selz (126) has approached the matter experimentally and found not only synthetic and analytic formulation (though not identical with the types described by Paul and Wundt), but also a third kind which he calls phrase-wise formulation. Delacroix (31) and Stern (129) emphasize the fact that in familiar expressions of familiar thoughts there is a good deal of automatism, the process of formulation being carried out unconsciously following the initial tendency aided by past associations and habitual linguistic organizations. Experimental work on the determination of present forms by past linguistic organizations has been done by Thumb and Marbe (137) and Esper (41, 42). Delacroix (29) lists various factors that help in determining verbal formulation. A general treatment of formal Expression, discussing various works, may be found in G. Stern (129).

The nature of the thought process antecedent to speech has been a subject of much controversy. The weight of opinion (see Pillsbury and Meader, 109, and the discussion by G. Stern, 129) seems to favor the view that visual imagery only rarely precedes verbal expression. Pick, Müller-Freienfels, C. and W. Stern, and many others, according to G. Stern, stress *Stellungnahme* or "adjustment" as the essential preliminary to speech, and Pick associates it with the imageless

element ("conscious attitude") of the Würzburg school. We cannot enter farther into this difficult problem.

The metaphor is an interesting case of formal Expression in which the thought of an object or event is expressed not through the conventional form representing this object or event, but through some associated form. Werner (150) claims that the metaphor arose out of the spirit of the taboo. He considers it to be a product of two tendencies, the tendency to suppress an idea whose expression is taboo, and the tendency to communicate through language. Nomads who have no taboos, according to Werner, have no metaphors in their speech. While doubtless many metaphorical usages, *e.g.* euphemisms, have arisen from the tendency to avoid direct expression of a thought that is soaked in strong feeling, this explanation is not sufficient. Bühler (17) contends that metaphors also arise from lack of speech-forms to express what is desired, and from the need for drastic characterization. Metaphors are obviously based upon association by similarity, while other figures of speech, such as the metonymy or the synecdoche, are based upon association by contiguity. A figure of speech like the metaphor expresses the various factors leading to its peculiar choice (since Expression is a causal relation), and is in this sense much more expressive than a term conventionally and familiarly used. Thus referring to a person as a "snake" expresses an attitude toward and a judgment upon this person, as well as mere thought of him. The metaphor thus involves an implicit predication, and combines the two formal modes of Expression we have mentioned (Expression of both thought and feeling, emotion and attitude).

Profanity is the extreme example of formal emotional Expression. When a person is aroused to profanity, why is it that certain words come to be used, particularly words having to do with religion? In an interesting article, Patrick (100) has given a Darwinian explanation of this in terms of serviceable retained habits. Just as in animals the growl or roar has the function of putting opponents to flight, so when human activity is thwarted and an anger situation characteristically developed, swearing serves to produce a shock, to arouse awe, dread or fear in the hearer, and thus to remove the source of irritation from the field. Hence the names of deities and the religious mysteries, which are sacred and full of awe for human beings, and also terms having to do with awe-inspiring natural phenomena, such as "thunderation," "tausend Donnerwetter," come to be used. Even vulgar words produce a shock and serve to indicate that the user is "so beside himself with passion that he must be in a very dangerous mood."

2. *Material Expression.* Brandl (13) reports extensive experiments in phonetics with English prisoners of the World War. The following results illustrate material variations in speech with formal constancy: the same speaker pronounces foreign words differently on different occasions; different speakers pronounce them differently according to their training, occupation, temperament, mood, occasional emotion, excitement, and physiological characteristics. Strictly

speaking, no person pronounces the same word twice alike and no two persons have exactly the same pronunciation.

Dumas (37) has suggested a few correlations between material features of speech and inner processes of the speaker which he explains through the effect of emotional states upon the muscles involved in speech production. A tonic emotion, like the excited forms of anger or joy, increases the intensity of an utterance by supplying the muscles of expiration with greater energy, while a depressive emotion, like the common forms of sadness or fear, decreases the intensity. Tonic emotions also raise the general tone of speech by their effect upon the muscles governing the contraction of the vocal cords and the opening of the glottis, make the voice sharper and more metallic by increasing the tension of the muscles involved in the oral resonance chambers, and generally increase the speed of utterance; while depressive emotions commonly lower the general tone of speech (*e.g.* low tone of melancholy), decolor the voice, and retard the speed of utterance.

There is definite evidence today from experiments by Allport and Cantril (3), Herzog (56), and H. C. Taylor (133) that personality is expressed, at least to some extent, by the speaking voice. Pear (103, 104) has written on this subject at length. In Allport and Cantril's investigation different voices were matched with objectively obtained information about 12 different features of personality, such as age, appearance, dominance, extroversion, etc. The ratios of correct matching were predominantly positive and in many cases significantly so. Highly organized traits of personality seemed to be more accurately and consistently matched with voice than were the specific features of physique and conduct.

Stockert (131), Swift (132), Teulié (134), and others have recently discussed the ways in which psycho-pathological conditions manifest themselves in speech. According to Stockert, the shy individual with an anxiety neurosis has a hasty, high-pitched, shaking voice; the over-compensating neurotic speaks with a sharp accentuation, as if to forestall contradiction; and in the emotionless speech of the schizophrenic there is only a mechanical tempo, the rhythm having been lost, while the increased affective component in the manic-depressive's speech increases its rhythmical character.

3. Physiology and Pathology of Expression. Surveys of the physiology and pathology of Expression can be found in Travis (139) and Ombradane (95), and further discussions in Pillsbury and Meader (109), Gelb (47), and Goldstein (52), so the problem need only be mentioned here. Speech is a highly complex and artificial act, involving the integrated and organized innervation of a large number of different peripheral organs having different central connections, and requiring for its proper execution a regulating, dynastic influence of one part of the system over others. On the basis of clinical and experimental evidence, dominance is often attributed to the left cerebral hemisphere in right-handed persons and to the right hemisphere in left-handed persons. When this delicate mechanism

is disturbed in different ways, different kinds of aberrations appear in the stream of speech. There has been a vast amount of literature on the subject of stuttering. A survey of theories may be found in Travis (139). Travis and Johnson (140) have also presented a convincing discussion of the relation of stuttering to handedness.

E. *Evocation*. Evocation has been defined as the causal relation between the speech-sounds and the hearer. Like Expression, it may be divided into formal and material Evocation.

1. *Formal Evocation*. There has been a good deal of laboratory work on the experiences involved in the "understanding" or "comprehension" of words. Cantril (20), Fischer (45), Hermann-Cziner (55), Moore (86), Schaefer (122), and Schröder (125) have contributed important recent articles dealing with this subject. Various kinds of processes are reported in these experiments—imagery, feelings of familiarity, acts of thinking, awareness of meaning, awareness of purpose, directional experiences, awareness of the sphere in which the word belongs, etc. Fischer lists 5 kinds of processes that may be involved and considers images to appear chiefly as illustrations. [Cantril found that a word could ordinarily be understood without any specific reference to imagery or conscious association, and that in the normal course of comprehension "general comprehension" came first, while "specific reference," if it appeared at all, (it especially appeared in delayed introspections) came later and more in the manner of an illustration of meaning than as a carrier of it. Cantril quotes Stout, Binet, Watt and Clarke as supporting the view of imageless comprehension, and considers that Bagley and Jacobson, who reported imagery as necessary for comprehension, did not consider carefully the temporal relations involved in the introspections of their subjects.] Hermann-Cziner found 3 types of understanding of the experimentally isolated word: pure, mediated, and explicative. In the pure, the word was simply understood without any definable experience; there was only awareness of meaning as an undifferentiated unit. In the mediated type other experiences came in: feelings, kinesthetic sensation, and above all visual imagery. In the explicative type the word was understood through other meanings, as through the meanings of subordinates or coördinates. It appears from the above works that the understanding of isolated words consists of processes that are not imaginal, but that imagery may appear in an illustrative or mediating rôle. According to Schaefer, the imageless elements in understanding are genetically based upon imaginal processes.

The problem of the processes constituting the "understanding" of a word is, of course, the problem of the nature of meaning, which has been a matter of dispute among philosophers and psychologists since ancient times.⁵ Ogden and Richards (94) give a list of 16 different definitions of meaning. Calkins (19) states 7 main senses in which the term has been used: as awareness of objects, as unique elemental experience, as supplemental imagination (context), as any relational experience, as signification, as implication, and as volitional experience. In a recent work Blumenfeld (10) distinguishes 5 different types of meaning. Since the problem of meaning really lies at the heart of psychological theory, each different system of psychology has a different theory of meaning. Titchener's existential system (138), for example, conceived of meaning as a sensory context accruing to a sensory core. The behaviorist, naturally enough, views meaning as response. Boring (12) has suggested that the accrual of context to core may be considered a special case of response, and Titchener's theory therefore subsumed under a super-behavioristic theory.

An interesting exegesis of the theory of meaning held by response psychology has recently been published by Latif (73), working under Holt. According to this view, a cognitive reaction having objective reference consists of a response that "points out or aims at some part of the environment," and "may further follow objects moving in space, and in general trace or explore (and thus in a sense re-create) the contours and relations of objects and their movements." When a similar response is made to a symbol instead of an external object, we have "meaning" instead of "awareness," or "perception"; "in the case of absent objects original neuromuscular patterns must have been learned which, even when the original object is absent, will re-create its surface contour." The meaning of even the most abstract terms and likewise of mathematical symbols is, in this radical exposition, a motor re-creation. In count-

⁵ Our discussion of meaning is limited to meaning in Evocation because practically all psychological work dealing with the subject is so limited. However, any of the relations in which speech signs enter may be considered a semantic relation. Thus the meaning of a sign in Expression would be the processes in the speaker that led to its production; in Representation the object, event or phase of external reality that it stands for (its referent). Since a speech sign also enters into relations with other speech signs in discourse, meaning may be defined in terms of such relations. Thus Schächter (121), following the Viennese positivistic line of thought, defines the meaning of a word as the rules of its usage.

ing, for example, one moves from one object to another, reproducing an aspect of the environment, and the meaning of a number symbol is thus a series of chain reflexes.

The comprehension of sentences is a more complex problem even than that of the comprehension of single words because individual sentences involve an aspect of novelty more often than do words. Bühler (16) reports that sentence or phrase meaning often comes suddenly after a pause, as if from nowhere. He calls this the "aha-experience." It appears to correspond very much to the sudden insight of which Köhler (68) speaks in reference to his experiments on apes. G. Stern (129), from a survey of experimental evidence, concludes that there are 2 main types of sentence understanding, "pure" or direct understanding, corresponding to Hermann-Cziner's pure understanding of the word and typical of the simpler and more familiar sentences, and "mediated" understanding, typical of complex and unfamiliar sentences. Imagery appears to come in more as a device through which the meaning of sentences not easily understood can be attained.

As in Expression, the metaphor in Evocation provides an interesting case of combinations of the objective and subjective modes. The context in which a metaphorical term appears is such that it leaves only a certain sphere of reference open, and the conventional referent of the term will not fit into this sphere. Consequently the thought of another referent adequate to the open sphere must be association by similarity (in the case of the metonymy or synecdoche it is association by contiguity). The attainment seems to involve imaginal and affective ("creative") experience. The property on the basis of which the association is made is brought especially into relief. Downey (36) has discussed the nature of the metaphorical consciousness at length, mentioning various theories and experimental investigations.

Many words have obviously strong emotional effects on the hearer, due to the contexts in which they have appeared in the past. This is especially true with words having to do with traumatic incidents, or with one's family, race, nation, religion, or political creed. There is a still unsettled problem, however, as to whether words differ in emotional effects because of differences in the aesthetic value of their respective phonemes and auditory configurations. Is "serene," for example, intrinsically or only by association more beautiful than "squawk"? Thorndike (135) conducted some experiments on euphony recently and concludes that "the differences commonly assumed, such as the superiority of vowels and liquids and the inferiority of gutturals and aspirates, have probably been over-estimated." He found that if nonsense words are rated, "they are likely to be pleasant or unpleasant according as they resemble meaningful words which are so." Poets and literary persons would probably not agree with Thorndike's conclusions.

2. *Material Evocation.* Material features in the speech phe-

nomenon are obviously of great importance in Evocation. It is told of a great evangelist that he could make men laugh or cry by the way he spoke the word "Mesopotamia." Bühler (17) reports the story of a Bonn student who brought a market woman to tears by declaiming the letters of the Greek alphabet to her. The author, however, is acquainted with no experimental work on this subject.

II. THE DEVELOPMENT OF LANGUAGE

A. *Phylogenesis.* 1. *Theories of Origin.* One may distinguish in general 4 kinds of theories of the origin of language: Representation theories, Expression theories, Evocation theories, and Social-behavioral theories. These theories differ in their emphasis upon the various functions of language, explaining the origin of language from the point of view of the function that is regarded as essential. A discussion of various theories may be found in Jespersen (60).

a. *Representation Theories.* In Representation theories the emphasis is upon naming—why particular speech-forms come to represent particular objects. An immediate connection is sought between word and thing. The onomatopoeia or "bow-wow" theory explains language as originating through imitation of the "natural sounds of the forest." According to the nativistic or "ding-dong" theory, taken up for a while and later abandoned by Max Müller (87), language arose in primitive man as the result of a faculty whereby each impression from without received its peculiar vocal expression from within, each object thus acquiring an appropriate speech-form.

b. *Expression Theories.* Expression theories seek to explain how man first came to express himself in sound and in such a way that his fellow men found significance in his utterances.

Wundt's (156) gesture theory is well known; according to it speech developed from involuntary expressive movements (gestures) which aroused ideas and feelings in the percipient similar to those in the maker of the gestures, and so led easily to the establishment of a voluntary gesture communication. Paget (97, 98), a leading exponent of the gesture theory today, considers the transition from a language of manual gesture to a language of vocal gesture to have occurred when primitive man began to develop craftsmanship and found difficulty in talking with his hands full. The interjectional or "pooh-pooh" theory holds that language developed out of vocal ejaculations emitted in conditions of strong feeling or emotion, the different speech-sounds becoming associated with the different external causes of their utterance. Noire's "yo-he-ho" theory (92) finds the origin of language in the rhythmic utterances with which primitive men accompanied their coöperative work. Another theory (34) finds the origin of language in the vocalizations emitted during festal activity.

Jespersen (60) finds it in primitive community singing—a meaningless song of joy sung over a slain foe comes to mean that foe, and is later extended to similar foes.

It will be noted that in all these theories there is an attempt to explain how expressive movements that flow spontaneously from certain psychic conditions come to be associated in the minds of a group with certain objects or situations—in the interjectional and gesture theories by virtue of the fairly universal and constant production of certain expressions in certain emotional situations; and in the others by the common social experience of sound and object or situation coming together.

c. *Evocation Theories.* Evocation theories find the origin of language in the capacity of primitive man to be affected by signs and respond to them as representing objects and situations. Sapir (118), for example, considers the origin of language to rest upon the “habit of interpreting certain selected elements in a situation as signs of a desired total one,” which gradually led to a “dim feeling for symbolism.”

d. *Social-behavioral Theories.* Social-behavioral theories consider language to have developed in social situations as a tool for social action and coöperation. Janet’s theory (discussed by Radin in the introduction to Vendryes, 144) supposes language to have originated in the leader-follower, command-obedience relationship: the leader inhibits his movements of pursuit, the inhibitions come out in vocal utterances, and these in turn guide the followers. De Laguna (33) has an elaborate theory of language as a development from animal cries (stressing particularly the development of proclamation and command), which occurred when our ancestors changed their dwelling from arboreal to terrestrial. The new situation demanded a great deal of social coöperation, especially in activities like group hunting, which could be realized only by the development of language. Social-behavioral theories of origin have a decided advantage over other theories in being more comprehensive, since the social-behavioral function assumes the 3 analytic functions and deals with language as a synthetic whole operating in society.

2. *The Evolution of Language.* There have been 2 main types of theory of linguistic evolution. One type, popular in the nineteenth century, conceives of the development of language as a building-up process involving the progressive combination and integration of a number of elementary building units called “roots.” The other, more recently popular, and ably expounded by Jespersen (60), con-

siders the process of evolution to be one of progressive differentiation of a number of primitive mass units. Jespersen formulates the law of linguistic evolution as follows: "the evolution of language shows a progressive tendency from inseparable irregular conglomerations to freely and regularly combinable short elements." These 2 theories of linguistic development have interesting counterparts in modern physiological and psychological theories of development. The root theory, for example, corresponds to the reflex theory of behavioral development, according to which more mature and complex behavior results from the combination and integration of a number of elementary reflexes; and the mass theory to the modern psychological conception of behavioral development as the progressive differentiation of original mass activity.

There has been much speculation about the nature of the original primitive language. If we grant that language arose in the concrete activity of primitive life and had originally no abstract, analytic elements, then 2 kinds of primitive units were possible. The first was a proper-name-like unit, representing a specific object, act, or event of importance in primitive life. Jespersen believes that the first linguistic units were of this sort. Since such a unit could really say nothing in itself, the remainder of the information to be conveyed, such as the predication we should give to a proper name, had to be gathered from context—from situational context, gestures, context of common knowledge (as, *e.g.* knowledge that an enemy was in the vicinity). Malinowski in discussing the speech of primitive Melanesian tribes lays great emphasis upon the dependence of their expressions on the "context of situation." The second possible kind was an inclusive unit, often called a "holophrase," which represented practically the whole of a concrete situation of importance in primitive life. The holophrase as a whole represented the situation as a whole, but there was no analytic relation between parts of the holophrase and aspects of the situation. The same object in different situations would have no common representation in the different holophrases. Latif (73) cites an example from Lord Monboddo of a North American Indian language in which one expression was used for "There is water in the bucket," and an entirely different expression for "There is a great deal of water in the bucket." The proper-name-like unit and the holophrase have often been confused.

3. *Linguistic Change.* Language is forever undergoing change, so that new languages continually evolve and differentiate themselves from their mother language and from each other, as in the Indo-

Germanic group. Linguistic change may be divided into structural change (including especially phonemic change) and semantic change. Innumerable factors have been proposed to explain structural changes: anatomical factors, geographical factors, national and racial psychology, change of *Weltanschauung*, tendency toward euphony, tendency toward ease of expression, emotional attitudes, analogy, transference to new individuals, etc. A discussion of such theories may be found in Jespersen (60). Zipf (159) argues for the theory of ease or economy of expression on the basis of his statistical work. The so-called "neo-grammarians" school reacted against all philosophical and psychological explanations, and confined itself to empirical statements, like Grimm's law, of regularities in linguistic changes (9). But such statements are by no means causal laws explaining the changes.

A detailed analysis and classification of semantic changes may be found in G. Stern (129).

B. *Ontogenesis*. McCarthy has recently published a survey of the development of language in children (78). Recent discussions are also to be found in Delacroix (32), Bühler (16), Markey (81), and Esper (40). The classical work on the subject is *Die Kindersprache* by C. and W. Stern (128). Discussion of the development of language in the child may be divided into 3 parts: sound development, semantic development, and social development.

1. *Sound Development*. Three stages are commonly distinguished in the development of the child's vocalizations: the crying stage ("screaming time," "period of laryngeal expression"), characterized by emotional utterances which the child produces as parts of total motor responses to strong stimuli, as hunger, pain, and rage, and which, according to C. Bühler (15), Bean (5), and O'Shea (96), vary in their nature with these stimulus conditions; the babbling stage (stage of "*Lallen*" or "random articulation"), in which vocal activity becomes a form of play engaged in for itself, and in the course of which the child runs the gamut of most linguistic sounds (54); and the talking stage, in which actual speech units are used. The mechanism which transforms the random articulations into crystallized speech units, such as "mama," "dada," "bye-bye," is commonly said to be the circular reflex. Its operation here has been clearly formulated by Allport (2). According to this theory, the child's imitations of the expressions of its parents are not new creations of the moment, but rather reproductions of sound units already established through circular reflexes. While the circular

reflex hypothesis may well explain the appearance of the first simple words, it is not adequate to explain the later acquisition of complex words and phrases. Here a more voluntary form of imitation seems to be involved.

2. *Semantic Development.* Semantic development (or the "ontogenesis of meaning") has been treated at length recently by Latif (73) and by Markey (81).

The early cries and babblings of the child are purely expressive, having no objective, representational significance (with expressive but not representational meaning). The same is true of the first sound units that become crystallized by means of the circular reflex, units usually combining, apparently for physiological reasons, the early common vowel *a* with one of the consonants *m, n, d, b, p, t*. But upon the appearance of these crystallized forms, the child's elders, to quote from Jespersen (60) "in their joy over the precocious child, assign to these syllables a rational sense, accustomed as they are . . . to the fact of an uttered sound having a content, a thought, an idea, corresponding to it." The mother, father, and nurse, who are in closest contact with the infant, like to fancy that the early sound-units refer to themselves. And Latif (73) writes, "The result of this egocentric delusion has been remarkable: in almost every known race, ancient or modern, the familiar names for mother, father, and nurse are one or the other following sounds, *ma, ba, pa, na, da, ta*, with the infantile reduplication."

By virtue of the adult's associating sound with object, event, or situation, the child comes to learn the meaning of words. The mechanism here is claimed by Allport (2), Latif (73), Marinesco and Kreindler (80), and others to be the familiar conditioned reflex. The adult speaks the name of an object, at the same time pointing at it or otherwise making it prominent. In time this sound becomes a conditioned stimulus to evoke the response originally called forth by the object. Parental influence also operates to fix certain chance associations that the child makes with objects, as *wu-wu* for spoon, and these forms, together with the bad approximations of the child to adult words and with onomatopoeic words, constitute the child's "little language." Onomatopoeia is considered by Latif to be an important source of meaning for the child, the characteristic sounds of certain objects arousing similar sounds in the child and becoming associated with the objects; but it is a question whether parental influence may not be the chief factor here also, for the child's onomatopoeic words seem to be largely forms taught him by the parent.

If Bühler (16), Delacroix (31), Koffka (67), Bean (5), and others are right in speaking of a "naming" stage in the child's

linguistic development, it would appear that the above simple explanation of the genesis of meaning through the conditioned reflex is not adequate. The child's learning of meaning seems to involve a sort of general insight into the representational relation. Delacroix speaks of "intellection," or comprehension of the function of the sign, which appears abruptly after the slower processes of conditioned responses, and is the "point of departure of the true development of language." The child comes somehow to understand the principle that particular objects and events have particular speech-forms associated with them. In the words of Bühler (16), "one of the most important discoveries (inventions) of man has penetrated into his mind, the fact that *everything has a name.*"

The child's first use of language, which, according to Jespersen (60), is subsequent to his first comprehension of language, consists of single-word expressions. To take an example from McCarthy (78), the child uses the expression "mama" to mean at different times "mama give me," "mama look," "there is mama," etc. Such expressions are considered to be equivalent to sentences by numerous writers—Koffka (67), De Laguna (33), Markey (81), Pelsma (105), Lukens (76), Bean (5), Latif (73), *et al.*—and are generally called "sentence-words," (although Bean uses the term "rhemes" and Latif "holophrases"). While these single-word expressions are equivalent to sentences from the point of view of Expression, it is quite false to consider them so from the point of view of language proper, for their representational value is by no means equal to that of a sentence—the same single-word expression cannot possibly represent on different occasions what we represent by different sentences. The child using it does not say all that he means, so that a good deal of what is conveyed by an adult sentence must be gathered from context (as is the case with the similar form of primitive expression).

The development of the child's speech toward the adult type goes hand in hand with mental development. Kern (66) concludes on the basis of experimental evidence that a definite stage of speech probably corresponds to a given degree of mental development, and that each developmental step of the latter requires its definite stage of speech. Words with general and relational meanings, associated with more abstract and analytic turns of thought appear later, according to the data of Waddle (146) and Nice (90). Lange and Neuhaus (72) associate likewise the appearance of the more complex forms of the sentence with more intricate thought processes.

3. *Social Development.* Piaget's work (106, 107) on the development of the social character of the child's speech, showing its egocentricity and its high correlation with the character of his thought, is well known. It should be noted, however, that a number of recent experiments, particularly those by McCarthy (78), Day (28), and Johnson and Josey (63), have failed to confirm the marked egocentricity that Piaget noted. Reconciliation of the different findings,

which are probably due to differences in technique, is yet to be achieved.

III. THE SIGNIFICANCE OF LANGUAGE

A. *Language and the Individual.* This section will be concerned with the significance that language has for various phases of the mental life of the individual. The discussion may be divided into three parts, the relation of language to perception, to the higher mental processes, and to behavior.

1. *Language and Perception.* The effect of language on perception appears to be to make those features of the objective world that are represented by linguistic forms stand out in greater articulation, to give greater individuality to the object or event so represented, to cause similarities to be seen in things similarly represented, and in general to influence perception in the direction of the speech-forms. Cassirer (25) and De Laguna (33) lay great emphasis upon the importance of language for the development of the external world of objects. Cassirer (25), for example, writes that language is "the most important and the most precise instrument for the conquest and for the construction of a true world of objects." It is in the development of the perceptual world of the child and of the primitive man, as De Laguna notes, that language is most significant.

There has been some experimental work bearing on the relation of language to perception. Gibson (51), working on the reproduction (by drawing) of visually perceived forms found that when the reproduction differed from the visually presented form the change was often conditioned by "cues from a verbal analysis which was made of the form during perception." Carmichael, Hogen, and Walter (21) had different words spoken before the visual presentation of the form, and found that reproduction of the form varied considerably with the particular word spoken. Two visual circles connected by a line, for instance, would be reproduced differently when preceded by "eye glasses" than when preceded by "dumb-bell." The authors attribute the change in reproduction to certain processes which are initiated by the word and which affect the apprehension of the visual form.

2. *Language and the Higher Mental Processes.* Willwoll (153) quotes Fichte to the effect that men are formed more by language than language by men. It is in the realm of the higher mental processes that this influence of language is greatest.

a. *Language and Thought.* The identification of thought and inner speech has been more than once asserted in the past, notably by Plato (110) and Max Müller (88). In more recent times Watson's announcement (148) that thought is merely implicit vocal

activity has provoked a great deal of discussion and experimentation. Adams and Powers (1) have summarized work on this subject. There is little agreement to be found today in answer to the following questions involved: first, whether thought may not be carried in visual imagery as well as in linguistic processes, especially in creative thinking, as stressed by Rignano (113); secondly, whether when thought employs internal speech, it is proper actually to identify the two, *i.e.* whether internal speech may not be merely a vehicle or tool of thought, but not thought itself; and thirdly, whether when thought is verbal there are actually implicit responses in the muscles involved in speech production which correspond to the responses made when these same words are spoken, *i.e.* whether there may not be verbal-auditory imagery in thought without corresponding implicit vocal activity. The behavioristic conception does not in general seem to be accepted. When a behaviorist says that thought is implicit vocal activity, there are two ways of interpreting his assertion: as a *statement about the psychological reality* which is considered in conventional speech to correspond to the term "thought"; and as a *definition of the term "thought" itself*, the way that the behaviorist proposes to use it. In the first case his assertion is apparently false; in the second we cannot say that it is true or false, but we may object to his usage of the term.

The problem of implicit vocal activity during inner speech has been subjected to experimentation with differing results. Thorson (136) investigated the movements of the tongue during internal speech. She found no qualitative correspondence between overt speech and implicit speech during verbal formulation of the same ideas, and concludes that what movements there are come chiefly from nervous irradiation. Jacobson (59), however, using a galvanometer and requiring his subjects to relax completely, reports good correlations. He found records of action currents in the muscles of the tongue and lips when his subjects imagined counting, or saying a poem, similar (though much fainter) to those from the actual counting or reciting aloud. Jacobson's technique is peculiar, however, employing as it does a state much like the state of heightened suggestibility found in hypnosis, where every central impulse appears to find ready outlet into open efferent paths.

Those who conceive of thought as inner speech generally regard the progression of thought as a sort of internalized conversation. Mead (83, 84) is an outstanding proponent of such a view. "Our thinking is inner conversation in which we may be taking the rôles

of specific acquaintances over against ourselves, but usually it is with what I have termed the 'generalized other' that we converse, and so attain to the levels of abstract thinking, and that impersonality, that so-called objectivity we cherish." Conversation in the form of argument is considered to be an exceptionally good prototype of logical thought. Piaget (107), for example, writes, "Logical reasoning is an argument which we have with ourselves, and which reproduces internally the features of a real argument. Ch. Blondel has given added importance to these views, by showing that pathological thought is the result of the given individual's inability to submit to social habits of thought." Since language phenomena are social facts, thought becomes socialized and in a sense objectified in so far as it takes on linguistic forms.

b. *Words and Concepts.* Words and concepts are obviously closely related. Smoke (127) and Willwoll (153), however, have independently concluded from experimental investigations that one may have concepts without corresponding verbalizations. The use of a word seems to bring a certain objectivity to a concept. Werner (151) claims that the reality of an abstract idea or concept comes into existence only through the medium of language. Romanes (115) has likewise stressed the objectivity bestowed upon ideas by speech-forms, distinguishing the "recept" or un verbalized idea from the "concept" or verbalized idea.

c. *Language and Consciousness.* Nietzsche (91) has claimed that consciousness depends upon language and communication. A somewhat complementary view may be seen in the claims of behaviorists and Russian reflexologists that the unconscious consists merely of inner un verbalized responses.

Mead has an interesting theory of the derivation of self-consciousness from linguistic activity. By verbal expressions one can stimulate not only others, but also one's self, and in the same manner as the others are stimulated. This capacity to produce the same response in one's self as in others allows one to take the rôle of others. And, "In so far as one can take the rôle of the other, he can, as it were, look back at himself from (respond to himself from) that perspective and so become an object to himself." Thus through language one becomes aware of one's self as an object (achieves 'self-consciousness').⁶

⁶ For Mead's ideas on this subject, see both *Philosophy of the Present* (84) and the posthumous volume, *Mind, Self, and Society* (83). For other discussions of the relation of language to self-consciousness, see Markey (81) and

3. *Language and Behavior.* The significance of language for behavior has often been remarked. De Laguna (33) has a long theoretical discussion of the matter. Lorimer (75) remarks that "Helen Keller, at the age of six, before her systematic instruction in symbolic activity, displayed a furious and uncontrollable temper. . . . Marie Heutin, the famous French blind deaf-mute, was described before the beginning of systematic instruction in symbolic activity as 'une animal furieuse.'"

Luria (77) stresses the significance of language for behavior, especially in reference to volition. He distinguishes 2 kinds of behavior: primitive, diffuse, impulsive behavior in which excitations pass over immediately into motor activity, characteristic of children, persons under strong affects, aphasiacs, hysterics, and other pathological subjects; and organized behavior, characteristic of normal adults, in which impulses do not pass immediately into the motor area but are elaborated behind a "functional barrier," so that the final acts are definite, organized, and directed. The elaboration that occurs before motor innervation and gives behavior its organized form is achieved, Luria believes, principally through speech. Man is not able immediately to control, and organize his acts, but can do so only through the "production of cultural stimuli mobilizing and directing the natural forces of behavior." The auxiliary stimuli which the human being creates for the control of behavior are primarily speech stimuli, which are first produced externally for the control of others, and then later internally for the control of his own behavior. Language thus lies at the base of volition, according to Luria, by providing organized, guiding stimuli for behavior. Cassirer (25) has also discussed the relation of language to volition. Furthermore, behavioristic work on the conditioning of previously involuntary responses, such as the pupillary response, to verbal stimuli implies a dependence of voluntary control of behavior upon speech. "Practically all of the responses of striped muscles which

Rogge (114). Mead does not limit the significance of language to thought and to the genesis of the self, which we have discussed, but makes participation in it the basis of morality and science as well. Morris, in the introduction to *Mind, Self, and Society*, gives the following summary of Mead's views: "By virtue of the internalization or importation of the social process of communication, the individual gains the mechanism of reflective thinking (the ability to direct his action in terms of the foreseen consequences of alternative courses of action); acquires the ability to make himself an object to himself and live in a common moral and scientific world; becomes a moral individual with instinctive ends transformed into the conscious pursuit of ends-in-view."

people learn can be learned more efficiently, and retained in a more predictable manner, when the person is given the usual verbal information in regard to the act which he is to learn." Cason (24) attributes to verbal activity in human subjects many of the irregularities found in conditioning, such as the fact that some experimenters have failed to get conditioned hand withdrawals with 1,000 repetitions of the stimulus, while others have been able to teach the withdrawals after only one repetition, and several subjects have established the connection independently of formal training.

Warden (147) performed an experiment on learning to run a stylus maze, in which the subjects were asked to report whether their procedure was worked out primarily in motor adjustments (relying on the "feel" of the movements), visual patterns, or verbal organization ("right forward and left forward, then right-forward three times," . . . etc.). The average number of trials for each type was respectively 123.9, 67.9, and 32.2. Esper (40) further discusses the rôle of verbalization in learning. Fedorov (43) has found that maldevelopment of speech impairs logical memory.

B. *Language and Society*. 1. *Social Use of Language*. Language has a number of significant uses or functions in society which are so obvious one hardly need mention them. The most important of them is that of controlling and coördinating social behavior. This is also without doubt the original social function of language. It has received a full treatment in De Laguna's book (33). A second function is the transmission of culture from one generation to another, and from one people to another. A third is the determination of national individuality (145). Historians list common speech as one of the most important factors that operate to establish and preserve nationhood. To the author's knowledge, it has never been satisfactorily determined, however, whether a national speech expresses a national character; i.e. whether the formal features in the language of a social group have a relation to the character of the group similar to the relation that certain material features ("voice") have to an individual personality. It seems natural that this should be so, and it is often claimed or taken for granted. Delacroix (29) declares that the grammar and the vocabulary of a language reflect the point of view of the social group, as well as its historical vicissitudes. A recent article (74) suggests that a number of constructions found in Goethe's later writings which are not found elsewhere in German speech and are not to be explained by dialect or on an historical basis, may be a "heritage" from his East European ancestors.

There is an interesting opposition between the uses of language

by poetry and science. This matter has received an excellent discussion from Richards (111). In poetry words are used primarily to express and evoke strong experiences, affective and imaginal in character. To mediate such experiences, poetry uses various devices, such as figures of speech (particularly the metaphor, whose expressive and evocative significance we have discussed), sound symbolism, emotionally weighted expressions, unusual constructions (to whose affective significance Zipf pays especial attention, 159), and the like. Because many words familiarly used seem to have lost affective and imaginal force, and are responded to with mere thought of the referent ("pure" understanding), there is a tendency in modern poetry, especially in an important group called the Symbolists (including such figures as Verlaine, Yeats, Joyce, Gertrude Stein, and T. S. Eliot), to avoid direct representation of things by familiar names and to attempt rather to create feelings and sensations concerning them. "To intimate things rather than state them was thus one of the primary aims of the Symbolists," Edmund Wilson (154) writes.

In science, on the other hand, language is used primarily for the representation of processes in nature. Here all emotional and "subjective" connotations in terminology are eschewed. The ideal scientific statement is a neutral, inter-subjective mathematical equation. Richards (111) has pointed out that scientific representation of reality, with its neutral, unemotional terms, leads to a "neutralization of nature," a taking of feeling, emotion, and thus, value, out of the world.

2. *Misuses of Language.* Language has not only its various uses, but also its misuses in society. Of these we may designate the principal ones as verbal magic, illogical persuasion, the substance fallacy, and verbal nonsense.

a. *Verbal Magic.* In verbal magic the representational relation is regarded as a fact of nature, rather than of social convention. Words are considered to have direct, magical connections with the things they represent, so that by manipulating words one can thereby immediately manipulate the things. The primitive man may believe, for example, that by reciting a certain verbal formula he will achieve a certain desired effect or that by changing his name he will change his identity. Verbal magic has been discussed by Ogden and Richards (94) in relation to primitive peoples, by Young (158) in relation to children. Holt (57) has made the charge of verbal magic against certain types of psychology.

b. *Illogical Persuasion.* By illogical persuasion is meant the use of terms having strong emotional connotations as a means of imparting a conviction rather than the use of fact and logic. The speaker uses words that are responded to positively, such as "loyalty," "freedom," "purity," "God," in relation to what he wishes to have accepted; and words that are responded to negatively, such as "treason," "tyranny," "filth," "atheism," in relation to what he wishes to have rejected. Illogical persuasion is especially to be found in propaganda and political language. Pareto (99) suggests that in order to see if an argument "relies on sentiment or the assistance of the more or less vague emotions stored up in the vernacular" one substitute plain letters of the alphabet for the key words in the argument and determine whether its cogency is thereby diminished.

c. *The Substance Fallacy.* Since most substantives in our language today refer to objects or substances in the external world (in the early stages of language presumably all substantives did), there is a tendency to believe that behind *every* substantive lurks a corresponding substance. Bentham (93) has pointed out the difficulties that such a belief leads to in relation to terms like "obligations," "liberty," and "rights." This fallacy is also to be seen in the old psychological view of the soul as a substance and in the assumption by physicists not so long ago that behind the word "time" lurks an absolute fluid substance. It was with the intention of avoiding such unjustified assumptions that Bridgman (14) formulated the operational method of definition, a method which defines the meaning of any concept as a set of operations. For a discussion of the operational theory of meaning, see also Boas and Blumberg (11), and for a criticism Dotterer (35).

d. *Verbal Nonsense.* The concept of verbal nonsense has acquired great importance in the recent work of the logical positivistic school. If one breaks rules of ordinary grammar in discourse, using words in ways which are forbidden, the result is neither true nor false, but meaningless (*Unsinn*). The logical positivists make a much finer analysis of the ways in which words may be used, distinguishing many more word-classes and rules of usage than does ordinary grammar. Consequently many combinations of words which for ordinary grammar are permissible break finer rules of usage that the positivists distinguish in their "critical grammar," and are therefore "nonsense." Indeed, the whole of metaphysics, according to this

school, is "nonsense." For a bibliography of logical positivistic publications, see Carnap (22). For a brief discussion of this school, see the introduction by Black to Carnap's *Unity of Science* (23).

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BOOK REVIEWS

SELIGMAN, E. R. A. (Ed.), *Encyclopaedia of the Social Sciences*.
New York: The Macmillan Co., 1930-35. 15 Vols.

The *Encyclopaedia of the Social Sciences* in fifteen volumes is now completed. It is, of course, not primarily designed as a tool for psychology, yet it possesses certain features of interest to those in the field. The book is edited by E. R. A. Seligman and Alvin Johnson with a staff of co-editors; F. H. Allport represents the field of psychology on a board of advisors.

The collection of volumes contains many fine biographical sketches. The policy of the editors of not including the lives of living scientists restricts its usefulness for social psychology, inasmuch as the greatest figures of this younger discipline are still alive, *e.g.* McDougall, Ross, and Dewey. Such psychologists as Pavlov and Freud, whose contributions have been in other fields than social psychology, are also omitted. This is not because of lack of interest in their contributions as they apply to social science, for such concepts as the conditioned reflex and psychoanalysis are included. The justice in not including men whose contributions are of rather recent date is fairly clear; but in many of these instances where the systematic contributions date back as far as the nineties, or the first ten years of this century, it seems a different matter. Many able scholars in the field of sociology whose contributions reach back fifty years are omitted for the same reason. As a result of this editorial policy the value of the biographical sketches to psychologists would seem to lie in the lives of great figures in social science fields other than psychology.

The attitude of the editors toward certain other materials of the encyclopaedia is not entirely clear. Various portions seem definitely written from an eclectic standpoint; Sapir's account of personality is such an example. But there are many descriptions which seem definitely doctrinaire. Most of Bernard's writing seems of this kind. Much might be said in defense of either type of writing for other purposes. However, if an encyclopaedia wishes to appeal universally, it would seem imperative that it adopt the eclectic viewpoint. Thus the term "attitude" is used by both the psychologist and the sociologist. An eclectic account would no doubt include both views.

Bernard's account, however, leaves out many points that the field of psychology would very probably insist upon. Note the definition of attitude in Warren's *Dictionary of Psychology* as compared with Bernard's definition. If a doctrinaire method is to be adopted, the usefulness of such an encyclopaedia is limited to the disciples of a particular point of view or a particular discipline. It seems very doubtful that the editors meant to establish such a policy.

Such concepts as *polarization*, *social facilitation*, *attitude of conformity*, *coenotropes*, *pluralistic ignorance*, *sentiment*, *social projection*, *psychic distance*, etc., are not included. These terms are not terms of individual psychology, but of social psychology. Their absence is quite unexplainable. They represent some of the most important ideas of this infant discipline. Inasmuch as several of these concepts were the work of F. H. Allport's pioneering efforts, it seems strange that he should represent psychology on the editorial board and these concepts be omitted. Certainly the social science field is not by implication turning these obviously social concepts over to psychology as their sole property?

Finally, attention should be called to the bibliographies. They are exceptionally complete; perhaps even more so in foreign fields than in English. The Russian, French and Italian references seem especially well covered, the German not quite so well. The Spanish is hardly covered at all. There seems to be some evidence that the zeal to cover the foreign fields completely has resulted in overlooking some of the materials here at home or in England. The co-editors were evidently selected for their ability in translation and this may account for the particular emphasis.

Such ventures as Murchison's *History of Psychology in Autobiography*, Warren's *Dictionary*, and this newly completed *Encyclopaedia* provide increasingly efficient sources of information for psychologists. The knowledge of man and his social relationships is already vast enough to necessitate such tools. Only in such a fashion does the division of labor in scientific exploitation of the world around us proceed as an efficient collective enterprise.

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ZIFF, GEORGE K., *The Psycho-Biology of Language*. Boston: Houghton Mifflin Co., 1935. Pp. ix+336.

The author regards speech as a coördinative tool of behavior, useful in defense, in aggression, and in all forms of adaptive conduct.

It is a natural and measurable phenomenon. Its function is scarcely to be distinguished—unless by its social reference—from the functions of the hand or any other tool. As compared with other behavioral units, the author believes speech-units have the special advantage of ready quantification. Since this objectivity and accessibility of linguistic phenomena are certainly more true of written language than of spoken language, and of speech-elements as employed by the speaker (or writer) than as understood by the auditor, it is inevitable that Dr. Zipf in adopting as his method the "application of statistical principles to the observable phenomena of the stream of speech," should confine himself almost wholly to *written* records of speech-forms, and to the "*stream of speech*" itself, rather than enter the more subjective psychological fields of meaning, intention, expression, and thought.

The factual portion of the book, its greater part, deals with the conditions and consequences of the varying frequency of speech-elements: phonemes, morphemes, words, and—to a less degree—sentences. In general it seems true—the evidence being clear and abundant—that high frequency of occurrence and low intensity are linked; or to put it another way, high relative frequencies of speech-elements seem incompatible with any type of emphasis. Five of the author's findings may be used to illustrate this general principle. (1) The magnitude of complexity of a phoneme varies inversely with the relative frequency of its occurrence; (2) the length of a morpheme (it is equally true of a word) varies inversely with the relative frequency of its occurrence; (3) the degree of emphasis (accent) within the word varies inversely with the relative frequency of the occurrence of the accented portion; (4) the degree of distinctness of meaning of a morpheme seems likewise to be an inverse function of the relative frequency of the occurrence of the morpheme; (5) emotional intensity and distinctness of meaning (estimated, not measured) seem to vary inversely with the brevity (crystallization) of an expression, which in turn is a function of its frequency of occurrence. (For example, sentences on the whole are more meaningful and more emotive than the average single word.)

Such findings lead the author to postulate a principle of Equilibrium in language. Speech-elements, particularly when frequently employed, will become as brief and as crystallized as they can. "Nature abhors a disordered unintegrated condition in biological process, of which language is but one manifestation. Behavior functions in a direction prevailing toward greater and more crystallized

patterns" (p. 207). This dynamic tendency toward condensation is halted by such counter-influences as force of habit, a necessary minimum of distinctness for any speech-element to prevent its total disappearance, and by the restraining effect of analogical forms. The requirements of the auditor, that speech be comprehensible, likewise places a limit upon the tendency. In general, "there is a charting of a course in speech between dull over-articulation and incomprehensible under-articulation" (p. 218). Equilibrium prevails.

Although the importance of the auditor in determining the distinctness and brevity of speech-units is admitted, the author in explaining the principle of Equilibrium, is inclined to place far more stress on the economizing of the speaker's effort. "That economy, or the saving of time and effort, is probably the underlying cause of the maintenance of equilibrium is apparent from the fact that the purpose of all truncations and transitory contextual substitutions is almost admittedly the saving of time and effort" (p. 38). But the reverse emphasis would seem even truer. Are not the needs of the auditor far more decisive than the convenience of the speaker? To use an example from current psychological vocabulary, an interesting truncation may be found in the term *Narcissism*. With increasing frequency it is rendered as *Narcism*, whereas its original etymological form must have been *Narcissusism*. Is this instance of haplogy due merely to the speaker's desire to save time and effort? Much more likely it is a case of reduced cues in comprehension. As in all learning, unnecessary elements come to be disregarded. The truncated word is all that the listener needs. With the passage of time the learner in setting a stimulus-pattern for his auditor comes to leave out the elements that have added nothing to his own comprehension. The "saving of time and effort" seems a somewhat strained explanation as compared with the more universal process of cue-reduction in learning.

The volume contains innumerable invitations to the psychologist to undertake supplementary studies. The Gestalt psychologist especially will find congenial problems, such, for example, as is suggested by the following observation on phonemic change. "Once the change has commenced, it runs its course like a self-limiting disease with the general result that the affected phonemes which survive are again stable though changed" (p. 88).

Only at one or two points does the book deal with phenomena beyond the psychologist's alleged field of competence. What earthly suggestion might any psychologist make, for example, toward

explaining the following curious result, support for which Dr. Zipf draws from extended samples of English, Latin, and Chinese prose. "When the words of a vocabulary are ranked in the order of frequency, the average 'wave length' (the reciprocals of the frequency), or otherwise expressed, the average number of words occurring between its average occurrences, are approximately successive multiples of ten." That is, the most frequent word in a sample occurs on the average once in approximately every 10 words, the second most frequent word once in every 20 words, the third most frequent, once in every 30 words, and so on. The author himself has no explanation, though such ratios, he points out, "seem in accord with Nature's frequent fondness for simple relationships." If this explanation does not satisfy the psychologist, what can he possibly offer by way of improvement? No individual, as Dr. Zipf points out, ever selects his words with the intention of preserving precisely this harmonic series! Must language be viewed, therefore, as a super-organic system possessed of quasi-biological rhythms? The psychologist squirms at this point, but lacking any other explanation for the result in question, he is forced to be silent.

The whole conception of 'psycho-biology' as applied to language seems at best only metaphorical; and when redacted into the psychologist's grooves of thought it arouses conflicts and misgivings. It seems to the psychological reader that the sub-title, *An Introduction to Dynamic Philology*, would be a more appropriate title for the volume. He is somewhat dissatisfied too with the heavy burden sustained by the author's simple version of "economy of effort," and feels that the psychology of linguistic change must involve more factors of comprehension and meaning than are dealt with in this volume.

But these dissatisfactions are relatively unimportant when the significance of the work as a whole is considered. Not only has a large quantity of important and interesting material been made available, with original and felicitous observations upon its significance for psychology, but the author has even supplied from time to time, novel hypotheses of a psychological order where he needed them and could find none available. In so doing his work invites not criticism so much as counter-offerings. If psychologists are not content with some of his interpretations of the mental counterparts of linguistic change, what better have they to offer?

GORDON W. ALLPORT.

Harvard University.

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MCDUGALL, W., *Religion and the Sciences of Life*. Durham, N. C.: Duke University Press, 1936. Pp. xiii+263.

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NOTES AND NEWS

PROFESSOR EDWARD S. ROBINSON, Yale University, has been elected to the vice-presidency of Section I (Psychology) of the American Association for the Advancement of Science, and Professor John P. Nafe, Washington University, has been elected to the Section Committee.

THE OHIO STATE UNIVERSITY announces the endowment of the Elizabeth Clay Howald Scholarship by the late Ferdinand Howald, an alumnus of the Ohio State University, in memory of his mother, Elizabeth Clay Howald. Appointments will be made annually and the scholar will receive an honorarium of \$3,000 paid in 12 equal monthly installments.

Any person who has shown marked ability in some field of study and has in progress work, the results of which promise to be an important contribution to our knowledge, shall be deemed eligible to appointment to this scholarship. If the scholar has ever been a student of the Ohio State University or a member of the university staff, he may carry on his investigation either at the Ohio State University or, subject to the approval of the Graduate Council, elsewhere either in this country or abroad where superior advantages for his particular field of study are available. If the scholar has never had any connections with the Ohio State University, however, he must carry on his investigation at the Ohio State University.

Prospective candidates may secure application blanks by addressing the Dean of the Graduate School, the Ohio State University. Applications must be filed not later than March 1. The appointment will be made on April 1 and the term of appointment will begin July 1.

THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE, at its recent meeting in St. Louis, made a grant to the American Institute for the Deaf-Blind for the use of Professor Robert H. Gault as follows: "For designing and construction of the amplifying and receiving units in the Teletactor and to bring the whole apparatus up to certain requirements."

FINANCIAL REPORTS OF PUBLICATION ENTERPRISES OF THE AMERICAN PSYCHOLOGICAL ASSOCIATION

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Disbursements

Printing regular issues.....	\$9,587.85
Extra printing for prior publication.....	972.83
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Editors' allowance and salary Business Office.....	2,026.93
Postage, stationery and office supplies.....	156.71
Taxes, insurance, deposit box, Business Editor's bond....	71.34
Payments transferred to Abstracts and Jour. Abn.....	675.49
Payments refunded.....	75.79
Mailing back numbers.....	60.91
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Disbursements on Psychological Monograph Account.....	2,498.24
Balance, December 31, 1935.....	7,799.56
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JANUARY 1 TO DECEMBER 31, 1935

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Disbursements

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Printing reprints.....	351.77	
Clerical work.....	470.00	
Editor's allowance.....	150.00	
Office supplies.....	20.04	
Refunds and miscellaneous expense.....	41.75	
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PSYCHOLOGICAL ABSTRACTS

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Balance, December 31, 1935.....	9,371.00
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Associate Editor's salary.....	\$3,000.00
Secretary's salary.....	1,500.00
Editorial Office expenses.....	759.50
Abstractors.....	1,454.91
Translators.....	176.42
Tax on checks (December, 1934).....	1.38
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Balance, December 31, 1935.....	559.47
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